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Major Aquaculture Associations, Education and Research Resources in the United States

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Major Aquaculture Associations, Education and Research Resources in the United States

National Agricultural Library
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in conjunction with
Department of Fisheries and
Allied Aquacultures
Auburn University

June 1983

INTRODUCTION

This directory identifies major educational and technical assistance organizations as well as associations working with aquaculture in the United States. Aquaculture is defined as the controlled cultivation of animals and plants, including finfish, crustaceans, mollusks, and seaweed. It gives those involved in aquaculture research, production, study or promotion a convenient method of locating facilities, organizations, study opportunities, and names of resource organizations and people. The directory serves as a source of primary contact at the national and state levels for technical assistance and information on programs. An important objective of this publication is to provide impetus for improved communication among those in the public and private sectors involved in aquaculture. This is also true of companion volumes recently issued or in preparation:

Directory of Aquaculture Information Resources. USDA, National Agricultural Library through a contract with Aspen Systems Corporation, Dec. 1982. 53 pages. (USDA Bibliographies and Literature of Agriculture series No. 25.) Available from NTIS as PB 83176388, for \$10.00 paper copy, \$4.50 microfiche.

Aquaculture Research: A Directory of USDA and State Projects in CRIS. USDA, National Agricultural Library and Cooperative State Research Service, Jan. 1983. 357 pages. (USDA Miscellaneous Publication No. 1432.)

Aquaculture Bibliography for 1970-82; in preparation.

These three volumes are available from the Field and Special Programs Division, Room 300, National Agricultural Library, Beltsville, MD 20705.

Interest in this area resulted in the passage of the National Aquaculture Act of 1980 (P.L. 96-362). Coordination or compilation of specialized information tools such as this one was of the activities mandated in the Act.

Content

The data were gathered and evaluated for inclusion by Auburn University's Department of Fisheries and Allied Aquacultures under the auspices of the National Agricultural Library. Among the groups included are:

Major educational institutions including data on their aquaculture courses, capabilities, facilities, and staffs.

Private organizations and associations.

Departments or units of State governments.

Federal agencies and organizations with aquaculture responsibilities.

The wide range of activities should give the reader sufficient information on the functions, activities and organizations to determine whether further contact would be useful. Attempts were made to provide comprehensive coverage within the pre-set limitations. However, some organizations or programs were excluded due to lack of response to requests for data, termination of programs, or minimal involvement with aquaculture.

Organization

The directory is in two main parts.

1. The first is a detailed description of college and university aquacultural programs and capabilities.
2. The second section (entries 50-175) includes associations, government organizations and other groups active in aquaculture.

A third, smaller section is a selected listing of State Cooperative Extension programs with narrative descriptions.

Indexes

The Personal Name Index lists those individuals in the first two sections (entries 1 through 175); the Subject and Organizational Index provides access to all three sections.

Acknowledgements

Special appreciation is expressed to Dr. Bryan L. Duncan, Auburn University, whose patient handling of the project and knowledge of aquaculture have made this a useful document. Miss Georgette Semick and Mr. Bart Stringham, Aspen Systems Corporation, worked closely with Dr. Duncan and the NAL staff to provide a consistent and readable publication.

Special appreciation is given to Mr. John Forbes for his tireless management of numerous details, and to Mrs. Joan Lippincott, Mann Library, Cornell University, who provided editorial assistance.

Two scientists at educational institutions reviewed the publication: Dr. E. L. Torrans, University of Arkansas at Pine Bluff, and Dr. Wallis Clark, University of California at Davis. We appreciate their efforts and counsel.

Comments on the content, format, and usefulness of this publication should be sent to the Field & Special Programs Division of the National Agricultural Library.

WALLACE C. OLSEN, Chief
Field and Special Programs Division
Room 300 - National Agricultural Library
Beltsville, Maryland 20705
301 344-3834

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Section I. Colleges and Universities

ALABAMA

1. **Institution:** Auburn University
Location: Auburn, AL
Departments/ Directors: Auburn University; Auburn, AL 36849; (202) 826-4786
Fisheries and Allied Aquacultures / E.W. Shell
Agricultural Economics and Rural Sociology / J.H. Yeager
Degrees Granted: BS, MS, Ph.D., Masters of Aquaculture
Current Students: 12 BS, 66 MS, 18 Masters of Aquaculture, 42 Ph.D., 34 Certificate
Students Since 1970: 97 BS, 192 MS, 23 Masters of Aquaculture, 68 Ph.D., 360 Certificate
Courses: Principles of Aquaculture, 5 credit hours, annually
Utilization and Management of Multiple-use Aquatic Resources, 5 credit hours, annually
Organizing, Programming, and Implementation of Aquacultural Extension, 5 credit hours, annually
Fish Breeding, 3 credit hours, annually
Hatchery Management for Food Fish, 5 credit hours, annually
Hatchery Management for Sport Fish, 5 credit hours, annually
Pond Construction, 5 credit hours, annually
Management of Aquatic Flora in Fisheries and Aquaculture, 5 credit hours, annually
Management of Small Impoundments, 5 credit hours, annually
Aquaculture-Gulf Coast, 9 credit hours, annually
Fish Processing Technology, 5 credit hours, annually
Water Quality Management in Aquaculture, 5 credit hours, annually
Fish Nutrition, 5 credit hours, annually
Special Problems in Computer Application and Technology Transfer, and other areas of departmental expertise, 2-5 credit hours
Water Utilization in Aquaculture, 5 credit hours, annually
Practical Fish Culture, 5 credit hours, as arranged
Biological Productivity and Water Quality, 5 credit hours, annually
Advanced Biological Productivity and Water Quality, 3 credit hours, annually
Fish Parasitology, 3 credit hours, annually
Fish Diseases, 5 credit hours, annually
Advanced Fish Parasitology, 3 credit hours, annually
Clinical Fish Disease Diagnosis, 1-3 credit hours, as arranged
Fish Pathology, 3 credit hours, annually
Limnology, 5 credit hours, annually
Morphology of Fish, 5 credit hours, annually
General Ichthyology, 5 credit hours, annually
Fishery Biology, 3 credit hours, annually
Aquaculture, 5 credit hours, annually
Advanced Microbial Diseases, 3 credit hours, annually
Economics of Aquaculture I, 5 credit hours, annually
Economics of Aquaculture II, 5 credit hours, annually
General Facilities: 231 earthen ponds, 88 ha total surface area; 92 concrete ponds, 1.8 ha total surface area; 200 plastic pools, 1,414m² total surface area; numerous cages; 18 concrete holding tanks, 106m² total surface area.
Specialized Facilities: Fish processing technology lab, fish reproduction lab, fish nutrition lab, aquacultural water quality lab, fish pathobiology lab, hatchery technology lab
Cooperators: S.E. Association of Fish and Wildlife Agencies, United States

**Project/
Objectives:**

Fish and Wildlife Service, USAID, Cooperative Extension Agency

Selective Breeding in Catfish--Improve the culture traits of catfish, document characteristics of present breeds, and develop protocol for the distribution of improved breeds.

Off-Flavors in Pond-Raised Catfish--Identify organoleptically and chemically compounds associated with various types of off-flavor in pond-raised catfish; identify pond conditions associated with the various off-flavors.

Warmwater Aquaculture--Develop and advance methods required for the economic rearing, processing, and marketing of warmwater aquatic animals with economic potential; nutrition.

Warmwater Aquaculture--Develop and advance methods required for the economic rearing, processing, and marketing of warmwater aquatic animals with economic potential; aquatic animal disease.

Warmwater Aquaculture--Develop and advance methods required for the economic rearing, processing, and marketing of warmwater aquatic animals with economic potential; product development and quality assurance.

Warmwater Aquaculture--Develop and advance methods required for the economic rearing, processing and marketing of warmwater aquatic animals with economic potential; genetics and breeding.

Off-Flavor in Pond-Raised Catfish--Characterize the biochemical nature of off-flavor in pond-raised catfish. Identify organisms and pond conditions associated with off-flavor in catfish.

Effects of Environmental Temperature on Protective Immunity in Channel Catfish--Determine the effect of environmental temperature on longevity and stability of humoral immunity in channel catfish. Determine the effect of environmental temperature on protective immunity in vaccinated channel catfish. Determine the effect of environmental temperature on opsonization ability of sera from immunized channel catfish.

Integration of a Solar Greenhouse With a Recirculating Fish Culture System --Determine the operational characteristics of a solar heated greenhouse, thermal storage and heat recovery facility for fish culture. Evaluate a recirculating fish culture system compatible with the greenhouse, thermal storage and heat recovery facility. Develop design and cost information based on the above to enable full-scale production system to be built.

Pond Fertilization and Liming--Determine the solubilities of different phosphorus fertilizers in pond waters. Evaluate fluid fertilizers for use in sport fish ponds. Investigate use of low rates of calcium hydroxide for liming ponds which have excessive overflow during winter and spring.

Culture Systems for Year-Round Marketing of Fish From Watershed Ponds--Develop techniques for producing, harvesting, and marketing aquacultural crops from watershed ponds throughout the year.

Transmission and Immunology of Channel Catfish Virus Disease of Cultured Catfish--Demonstration of a carrier site or latency of channel catfish virus in channel catfish (CCV). Determine the mode of vertical CCV transmission through a breeding study. Determine the influence of environmental factors on the

epizootiology of CCV disease.

Services:

Aquaculture--Conduct various experiments on aquaculture.
Disease diagnosis, short courses in aspects of fish health,
information services (reprints, publications)

Funding Sources:

State appropriations, Federal (Hatch), USAID

Student Support:

Grants, hourly work, research assistantships, fellowships

Faculty/Staff:

Allison, Ray; Associate Professor; Ph.D. in fisheries;
experience in parasitology and intensive fish culture systems;
100 percent of time to aquaculture.

Bayne, David R.; Assistant Professor; Ph.D. in fisheries
management and Botany; experience in aquatic weed management
and ecology of fish culture ponds; 35 percent of time to
aquaculture.

Bowman, Jim; Research Associate; M.S. in hatchery production;
experience in aquaculture extension and international
development; 100 percent of time to aquaculture.

Boyd, Claude E; Professor; Ph.D. in Water Chemistry; experience
in water quality in fish culture; 100 percent of time to
aquaculture.

Clonts, Howard A.; Professor; Ph.D. in resource economics;
experience in resource economics; 60 percent to aquaculture.

Cremer, Michael C.; Assistant Professor; Ph.D. in Aquaculture;
experience in international development and aquaculture; 100
percent of time to aquaculture.

Davies, William D.; Associate Professor; Ph.D. in fisheries;
experience in fisheries management in small impoundments; 10
percent of time to aquaculture.

Duncan, Bryan L.; Associate Professor; Ph.D. in fish
parasitology; experience in international development and
brackish water aquaculture; 100 percent to aquaculture.

Dunham, Rex; Assistant Professor; Ph.D. in fish culture;
experience in fish breeding and fish culture; 100 percent to
aquaculture.

Goodman, Randell K.; Research Associate; M.S. in aquaculture;
experience in fish production and hatchery management; 100
percent to aquaculture.

Grizzle, John M.; Associate Professor; Ph.D. in fish pathology;
experience in fish pathology and morphology; 100 percent to
aquaculture.

Grover, John H.; Associate Professor; Ph.D. in fisheries;
experience in international training and development, fisheries
biology and aquaculture; 100 percent to aquaculture.

Hollerman, William D.; Research Associate; M.S. in water
quality; experience in water quality in fish culture; 100
percent to aquaculture.

Jensen, Gary; Assistant Professor; Ph.D. in fish breeding;
experience in aquaculture and international development; 100
percent to aquaculture.

Jezek, Doreen A.; Research Associate; M.S. in fish health;
experience in fish health; 100 percent to aquaculture.

Johnson Malcom C.; Associate Professor; M.S. in fisheries management; experience in fish production and international development; 100 percent to aquaculture.

Limsuman, Tasanee; Research Associate; Ph.D. in fish nutrition; experience in fish nutrition, processing technology and feedstuffs; 100 percent to aquaculture.

Lovell, Richard T.; Professor; Ph.D. in animal nutrition and biochemistry; experience in fish nutrition, processing technology and feedstuffs.

Malvestuto, Stephan P.; Assistant Professor; Ph.D. in fisheries biology; experience in experimental design and statistics; 10 percent of time to aquaculture.

Molnar, Joseph J.; Associate Professor; Ph.D. in sociology; experience in extension administration; 5 percent of time to aquaculture.

Moss, Donovan D.; Professor; Ph.D. in fisheries management; experience in international fisheries and aquaculture development; 100 percent to aquaculture.

Nerrie, Brian; Research Associate; M.S. in fish production; experience in aquaculture extension and international development; 100 percent to aquaculture.

Phelps, Ronald P.; Associate Professor; Ph.D. in fish health; experience in aquaculture and international aquaculture development; 100 percent to aquaculture.

Plumb, John A.; Associate Professor; Ph.D. in fish health; experience in fish disease diagnosis and control; 100 percent to aquaculture.

Popma, Thomas; Research Associate; Ph.D. in fish nutrition; experience in fish culture and international development; 100 percent to aquaculture.

Prather, E.E.; Associate Professor; Ph.D. in fish production; experience in fish production; 100 percent to aquaculture.

Pretto, Richard C.; Adjunct Professor; Ph.D. in aquaculture; experience in integrated aquaculture and administration; 100 percent to aquaculture.

Ramsey, John S.; Ph.D. in ichthyology; Coop. Fish. Unit; experience in ichthyology; 30 percent to aquaculture.

Rogers, William A.; Professor; Ph.D. in fish parasitology; experience in fish parasitology; 100 percent to aquaculture.

Rouse, David B.; Assistant Professor; Ph.D. in shrimp culture; experience in crustacean culture; 100 percent to aquaculture.

Schmittou, H.R.; Professor; Ph.D. in aquaculture; experience in international development and aquaculture extension and planning; 100 percent to aquaculture.

Seesock, Wendy C.; Research Associate; M.S. in ichthyology; experience in aquatic ecology; 35 percent to aquaculture.

Shell, E.W.; Department Head; Ph.D. in fisheries and biochemistry; experience in administration of the department and the International Center

Shelton, William L.; Ph.D. in fisheries; Coop. Fish. Unit; experience in fish biology and reproduction; 40 percent to aquaculture.

Smitherman, R.O.; Professor; Ph.D. in fish pathology; experience in aquaculture and fish breeding; 100 percent to aquaculture.

Snow, Jack R.; Associate Professor; M.S. in fisheries management; experience hatchery management and fish culture facility construction; 100 percent to aquaculture.

Sullivan, Greg M.; Assistant Professor; Ph.D. in agricultural economics; experience in marketing; 20 percent to aquaculture. for Aquaculture.

Veverico, Karen L.; Research Associate; M. Agr. in aquaculture; experience in fish production; 100 percent to aquaculture.

Webber, Cliff; Research Associate; Ph.D. in limnology; experience in limnology; 50 percent to aquaculture.

Tuition: Resident undergraduate, \$760/term
Resident graduate, \$330/term
Out of state tuition waived for supported graduate students

Admission Criteria: In order of importance: grade point average, test scores (ACT, SAT, GRE), personal recommendations, State resident.

Applications From: Admissions; Auburn University; Auburn, AL 36849

ARKANSAS

- 2. Institution:** Arkansas State University, Drawer 8
Location: State University, AR 72467
Departments/Directors: P.O. Box 599; State University; Arkansas 72467-0599
Biological Sciences / John K. Beadles
Degrees Granted: BS, MS
Current Students: 10 BS, 5 MS
Students Since 1970: 15 BS, 25 MS
Courses: Microbiology, 4 credit hours, twice annually
Aquatic Plants, 3 credit hours, alternate years
Mycology, 3 credit hours, alternate years
Aquatic Entomology, 3 credit hours, alternate years
Fishery Biology, 3 credit hours, annually
Parasitology, 4 credit hours, annually
Ichthyology, 3 credit hours, annually
Limnology, 3 credit hours, annually
Immunology, 4 credit hours, annually
Aquatic Biology, 3 credit hours, annually
- General Facilities:** 3 earthen ponds, 2 ha total surface area; 6 cages/pens, 32m2 total surface area.
- Cooperators:** Arkansas Game and Fish Commission, Fish and Wildlife Service--Stuttgart, Arkansas
- Project/Objectives:** Cage Culture of the White Amur--Eliminate hauling large poundages, eliminate predation on fingerling fish, reduction in labor at harvest time, extra pond space in hatcheries.
- Pathobiology of Catfish--Identification of new pathogens, inspecting stocks for carrier populations.

Services: Disease diagnosis, informal consultation
Funding Sources: State appropriations, research grants from state and Federal agencies
Student Support: Grants, hourly work, teaching assistantships, research assistantships
Faculty/Staff: Beadles, John K.; Professor; Ph.D. in fisheries biology; experience in ichthyology and fishery biology; 25 percent of time to aquaculture.
 Harp, George L.; Professor; Ph.D. in limnology; experience in limnology; 50 percent time to aquaculture.
 Richards, Edward L.; Professor; Ph.D. in plant taxonomy; experience in aquatic plants; 30 percent time to aquaculture.
Tuition: Resident undergraduate, \$360/term
 Resident graduate, \$360/term
 Non-resident undergraduate, \$610/term
 Non-resident graduate, \$610/term
 Tuition is not waived for supported graduate students
Admission Criteria: Grade point average, personal recommendations
Applications From: John K. Beadles, Chairman; Department of Biological Sciences; Arkansas State University; State University, Arkansas 72467

3. Institution: **University of Arkansas at Pine Bluff**
Location: Pine Bluff, AR
Departments/Directors: Agriculture/Fisheries
 University of Arkansas at Pine Bluff; P.O. Box 108; Pine Bluff, AR 71601; (501) 541-6686
Degrees Granted: BS
Current Students: 8 BS
Students Since 1970: 2 BS
Courses: Ichthyology, 3 credit hours, alternate years
 Limnology, 3 credit hours, alternate years
 Fish Pond Management, 3 credit hours, alternate years
 Fisheries Seminar, 2 credit hours, annually
 Fisheries Science, 3 credit hours, alternate years
General Facilities: 41 earthen ponds 6.4 ha total surface area; 20 plastic tanks; 10 raceways; 40 cages/pens; 60 aquaria
Specialized Facilities: Fish reproduction, fish feed technology, hatchery technology, polyculture production, fish pathology, water re-use
Cooperators: Arkansas Game and Fish Commission; U.S. Fish and Wildlife Service, Stuttgart, Arkansas; CIFAD; Catfish Farmers of Arkansas; Arkansas Cooperative Extensive Service
Project/Objectives: Feeds and Nutrition--use of locally produced commodities in catfish feeds; least-cost formulations.
 Water Quality--water recycling; use of planktivores to improve water quality; pond design for water conservation.
 Polyculture--evaluation of various fish and shellfish species for culture with catfish, water quality improvement, additional food fish production, and catfish forage.
 Utilization of Watershed Ponds--increase production from private watershed ponds through management and cage culture.
 Crop Rotation
Services: Disease diagnosis, Aquaculture Training Programs, information services (reprints, publications)

Funding Sources: Federal (Hatch), CIFAD
Student Support: Loans, grants, hourly work, scholarships
Faculty/Staff: Evans, Earl E., Associate Professor; Ph.D.; 50 percent time to aquaculture.

Gray, L.; Extension Fish and Wildlife Biologist; M.S.; 100 percent time to aquaculture.

Haskins, C.J., Research Technician; M.S.; 100 percent time to aquaculture.

Lowell, F.; Research Assistant; B.S.; 100 percent time to aquaculture.

Newton, S.H.; Associate Professor; Ph.D.; 100 percent time to aquaculture.

Robison, W R.; Research Technician; M.S.; 100 percent time to aquaculture.

Torrans, E.L.; Associate Professor; Ph.D.; 100 percent time to aquaculture.

Tuition: Resident undergraduate, \$710/term
 Non-resident undergraduate, \$921/term

CALIFORNIA

4. Institution: Humboldt State University
Location: Arcata, CA 95521
Departments/ Directors: Chair, Fisheries Department, (707)826-3951, Humboldt State University, Arcata, CA 95521
 College of Natural Resources, Fisheries Department / Dr. George H. Allen
Degrees Granted: BS, MS,
Current Students: 133 BS, 31 MS
Students Since 1970: 404 BS, 100 MS
Courses: Fish Culture and Breeding, 3 credit hours annually
 Fish Culture Field and Laboratory Practicum, 1 credit hour three times a year
 Fish Disease Management, 3 credit hours annually
 Wastewater Aquaculture, 4 credit hours annually
 Advanced Fish Disease and Pathology, 4 credit hours annually
 Selected Topics, 1-4 credit hours variable
 Advanced Studies, 1-5 credit hours variable
General Facilities: 8 earthen ponds, 5 acres total surface area; 6 concrete ponds/tanks, 10 ft. diameter; 4 concrete ponds/tanks, 50 square ft. total surface area; 1 plastic pools, 4 ft. diameter 2 raceways, 1400 sq. ft. total surface area; 14 cages/pens, 168 sq ft; 4 redwood tanks, 6 ft. diam; 1 burrows ponds, 600 sq. ft. total surface area; 16 hatchery troughs, 320 sq. ft. total surface area; 48 heath incubators
Specialized Facilities: Aquacultural water quality, fish pathobiology, hatchery technology, aquacultural engineering, wastewater-seawater aquaculture system (City of Arcata), marine laboratory (Trinidad City), recirculating freshwater fish hatchery
Cooperators: California Cooperative Fisheries Unit, City of Arcata Salmonid Wastewater Aquaculture Program, Fred Telonicher Marine Laboratory, Trinidad, California (Humboldt State University)

facility)

Project/ Objectives: Effects of environmental factors on the ability of chemical cues to trigger settlement and metamorphosis of bivalve larvae--To test hatchery reared pediveligers of the mussel, *Mytilus edulis* and the oyster *Crassostrea gigas* for attachment and metamorphosis following exposure to DOPA, L-3, 4-dihydroxyphenylalanine, under a variety of experimental conditions;

Wastewater aquaculture program--Utilization of domestic wastewaters in salmonid aquaculture (rearing, imprinting, homing, fishway operation). Developing salmonid runs into an integrated wastewater treatment, wildlife and wastewater reuse scheme.

Services: Disease diagnosis, summer workshops for native Americans, information services (reprints, publications), rainbow trout pond development and management for recreational and commercial purposes

Funding Sources: State appropriations (Line item in budget), university grants and aids (HSU Foundation Small Grants Competition), NOAA Sea Grant Program, City of Arcata Public Works Budget, California Department of Fish and Game

Student Support: Loans, grants, hourly work, research assistantships, technical assistants (HSU hatchery), City of Arcata Scholarships (Tye Club)

Faculty/Staff: Allen, G. H.; Prof; PHD in Fisheries Biology; experience in Salmonid aquaculture; 50 percent time to aquaculture.

Fritzsche, R. A.; PHD in Marine Biology; experience in early life history of marine fishes; 5 percent time to aquaculture.

Hassler, T.; Adj. Prof.; PHD in Freshwater Fishery Biology; experience in reservoir biology and fisheries management; 10 percent time to aquaculture.

Hendrickson, G.; Assoc. Prof.; PHD in Zoology-Parasitology; experience in fish parasites and diseases fish culture; 75 percent time to aquaculture.

Roelofs, T. D.; Prof.; PHD in Aquatic Biology; experience in anadromous fisheries, limnology and freshwater fisheries ecology; 5 percent time to aquaculture.

Shaw, W.; Adj. Prof.; BS in Fisheries Management; experience in mariculture and shellfish culture; 100 percent time to aquaculture.

Welsh, J. P.; Prof.; PHD in Aquatic Biology; experience in marine fisheries and invertebrate culture; 15 percent time to aquaculture.

Tuition: Resident undergraduate, \$0/unit
Resident graduate, \$0/unit
Non-resident undergraduate, \$70/unit
Non-resident graduate, \$70/unit
Registration and Miscellaneous Service fees for all students: \$116/term

Admission Criteria: In order of importance: grade point average, test scores (ACT, SAT, GRE), personal recommendations, personal statement on area of interest

Applications From: Graduate Studies Coordinator; College of Natural Resources; Forestry Building; Humboldt State University; Arcata, California 95521

5. Institution: San Diego State University
Location: San Diego, CA
Departments/
Directors: San Diego State University; San Diego, CA 92182-0408; (714) 265-6523
Center for Marine Studies / Dr. Richard F. Ford
Degrees Granted: BS, MS, Ph.D.
Current Students: 30 BS, 15 MS, 2 Ph.D.
Students
Since 1970: 100 BS, 30 MS
Courses: Aquaculture, 3 credit hours, annually
Seminar in Aquatic Ecology (Advanced Topics in Aquaculture offered as one seminar topic), 3 credit hours, alternate years
General
Facilities: 5 concrete pond/tanks; 110 plastic pools; 2 raceways; 10 cages/pens; 20 larval culturing systems
Specialized
Facilities: Fish processing technology, fish reproduction, fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology, laboratory for studying use of thermal effluent in aquaculture.
Cooperators: Research Program at Bodega Marine Laboratory and U.C. Davis, California Department of Fish and Game, California Water Quality Control Board, Sea Grant Program, U.S. National Marine Fisheries Service, University of California, Davis, Aquaculture Systems International, Direccion de Pesca, State of Baja California, Mexico
Project/
Objectives: Use of Thermal Effluent in Lobster Culture--Develop technology for commercial culture of lobsters.

Aquaculture of the Purple-Hinge Rock Scallop--Develop technology for commercial culture of rock scallops.

Use of Thermal Effluent in the Culture of Striped Bass--Develop technology for commercial culture of striped bass.

Protective Measures Against Fusarium Disease in Shrimp--Develop methods of disease prevention for penaeid shrimp.
Services: Disease diagnosis, water quality analysis, information services (reprints, publications)
Funding Sources: Federal (Hatch), university grants and aids
Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships.
Faculty/Staff: Chen, Lo-Chai; Professor; Ph.D. in biology of fishes/oceanography; experience in aquaculture; 20 percent time to aquaculture.

Ford, Richard F.; Professor; Ph.D. in marine ecology/oceanography; experience in aquaculture; 20 percent time to aquaculture.

Leighton, David L.; Research Associate; Ph.D. in invertebrate biology/oceanography; experience in aquaculture; 75 percent time to aquaculture.

Phleager, Charles F.; Professor; Ph.D. in marine biology; experience in aquaculture; 50 percent time to aquaculture.

Shapiro, Harriette; Professor; Ph.D. in physiology; experience in pathogens in aquaculture; 10 percent time to aquaculture.

Steenbergen, James F.; Professor; Ph.D. in microbiology; experience in pathogens in aquaculture; 50 percent time to aquaculture.

Tuition: Van Olst, Jon C.; Research Associate; M.S. in biology of fishes; experience in aquaculture; 100 percent to aquaculture.
 Resident undergraduate, \$150/term
 Resident graduate, \$150/term
 Non-resident undergraduate, \$150 + 105 per unit/term
 Non-resident graduate \$150 + 105 per unit/term
 Tuition not waived for supported graduate students

Admission Criteria: In order of importance: grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications From: Dr. Lee McClenaghan; Department of Biology; San Diego State University; San Diego, CA 92182

6. Institution: University of California, Davis
Location: Davis, CA
Departments/Directors: University of California, Davis; Davis, CA 95616; (916) 752-1363
 School of Veterinary Medicine, Department of Medicine / Dr. Murray E. Fowler
 MS, Ph.D.

Degrees Granted: MS, Ph.D.
Current Students: 1 MS, 1 Ph.D.
Courses: Aquatic Animal Medicine, 2 credit hours, annually
General Facilities: 104 fiberglass tanks; Bodega Marine Laboratory with 80 tanks
Specialized Facilities: Fish pathobiology
Cooperators: California Department of Fish and Game, U.S. Fish and Wildlife Service (agreement pending), private fish farms, California Aquaculture Association

Project/Objectives: Immunization of Fish Using Antigen-Linked Immunoabsorbant--Vaccination of Fish
Services: Disease diagnosis
Funding Sources: State appropriations, university grants and aids
Student Support: Grants, hourly work
Faculty/Staff: Amend, Donald F.; Associate Professor; Ph.D. in fish pathology, microbiology; experience in fish pathology, microbiology; 100 percent time to aquaculture.
 Hedrick, Ronald P.; Assistant Professor; Ph.D. in microbiology; experience in fish virology; 25 percent time to aquaculture.

Tuition: Resident undergraduate, \$256/term
 Resident graduate, \$269/term
 Non-resident undergraduate, \$1,056.50/term
 Non-resident graduate, \$1,069.50/term
 Tuition is not waived for supported graduate students

Admission Criteria: In order of importance: Grade point average, test scores (ACT, SAT, GRE), personal recommendations, state residency

Applications From: Dean of the Graduate Division; University of California; Davis, CA 95616

7. Institution: University of California
Location: Davis, CA
Departments/Directors: University of California; Davis, CA 95616; (916) 752-7600
 Aquaculture Program, School of Agricultural and Environmental Sciences / Dr. Wallis H. Clark, Jr.

Degrees Granted: BS, MS, Ph.D. (MS and Ph.D. in classical disciplines that

Current Students: relate to aquaculture)
 Students 34 BS, 8 MS, 28 Ph.D.
 Since 1970: 12 BS, 5 MS, 8 Ph.D.
 Courses: Aquacultural Engineering, 3 credit hours, annually
 Introductory Aquaculture, 3 credit hours, annually
 Reproduction and Development of Aquatic Animals, 3 credit hours, annually
 Theory and Practice in Aquaculture, 15 credit hours, annually
 Fish Nutrition, annually
 Marine Food Science, 3 credit hours, annually
 Aquatic Animal Medicine, 2 credit hours, annually

General Facilities: Earthen ponds (limited), concrete ponds/tanks (many), plastic pools (many), raceways (limited), hatchery facilities for trout, sturgeon, striped bass, catfish, and lobster.

Specialized Facilities: Fish processing technology, fish and crustacean reproduction, fish and crustacean nutrition, fish and crustacean feed technology, aquacultural water quality, fish pathobiology, hatchery technology, aquacultural engineering

Cooperators: California Department of Fish and Game, State Water Resources Control Board, National Marine Fisheries Service, USFW, Sea Grant, fresh and saltwater industries, Collaborative Research Program (Title XII), working relationship with Mexican hatchery facility, cooperative research with Fish Culture Technology Program in Nanaimo, BC, Canada

Project/ Objectives: Environmental Requirements of Potential Aquaculture Fish Species--Determine the environmental requirements and limits of several California freshwater fishes with respect to temperature, dissolved oxygen, and other factors. These data would be used to indicate the adaptability of a species to aquaculture systems, including those receiving nutrient enrichment.

Nematode Parasites of Freshwater Fish: Biology and Effects--Determine the distribution, species, disease incidence and intensity of nematodes parasitic in freshwater, both game and nongame, cold and warmwater fish of the state. Investigate nematode life history and reservoir hosts. Determine the parasitic role in affecting fish growth and mortality. Investigate means of parasite control and management.

Nutritional Aspects of Aquaculture Systems--Learn more of nutrient requirements of crustacea, including such things as optimal dietary level of protein and the interrelationship of energy and protein in diets for juvenile and adult crustacea; develop the technology of better feed delivery systems, including encapsulation and other means of preventing nutrient loss by leaching.

Crayfish in California Rice Fields: Diet, Impact on Rice Production and Possible Returns in Harvest--Establish feeding habits of crayfish in rice fields with emphasis on their relationship to rice plants, insects, weeds and rice straw; determine the extent of crayfish population in California fields; investigate the effect of crayfish on rice production and field damage; examine the feasibility of a commercial fishery in the rice fields.

Molecular Endocrinology of Molting and Reproduction in Crustaceans--Characterize hormone receptors in a crustacean cell line; define the interactions between molting and ovarian maturation at the molecular level; purify and characterize

hormones involved in egg maturation and spawning, accurately measure the titer of the molting hormone during the course of the molt cycle in various crustacean species.

Aquaculture Pathology--Investigate the causes of diseases of those marine invertebrates which are being studied under the Aquaculture Program at the Bodega Marine Lab; expand disease diagnostic capabilities of the disease project.

Genetic Assessment and Development of Crustacean Aquaculture Stocks--Assess amounts of genetic variation within and between wild-caught stocks of cultured marine crustaceans, develop lobster and shrimp broodstock in which the mating system can be demonstrated with genetic markers, estimate environmental, genetical, and interaction components of growth and metabolic variability in laboratory-reared family groups.

Penaeidae Gametes, Their Structure, Activation and Fusion--Characterize the gametes, gamete activation and gamete fusion in selected members of Penaeidae. This work is prerequisite to the ultimate goal--the development of in vitro fertilization techniques.

Crustacean Nutrition and Feed Development--Define the nutritional requirements of crustaceans, define other important nutritional parameters (i.e., consumption assimilation, food conversion) for use in the economic evaluation of crustacean aquaculture, design appropriate nutrient delivery systems (i.e., stable, nonleaching microparticles for water-soluble nutrients, binding systems for particulate portion of pelletized rations, etc.) for aquatic crustaceans.

Survey of Diseases of Cultured Freshwater Fishes of California--Identify infectious diseases which limit production efficiency of freshwater aquaculture in California. Identify those diseases of freshwater fishes which limit the production of aquaculture and determine the extents of these diseases throughout the state. Catalog diseases found and describe conditions associated with the epizootics. Management techniques and procedures will be developed by which the aquaculturist can limit or eliminate losses due to disease.

Animal Breeding and Genetics of Fish--Establish pedigree stocks of fish for use in estimating genetic parameters and developing efficient methods of genetic improvement of hatchery populations. Apply biochemical electrophoretic techniques to the identification of genetic variability useful in characterizing the taxonomy of wild trout populations.

Economics of Aquaculture--Investigate the economic potential for commercial aquaculture. The long-range goal of this project focuses on the economic potential of species not presently identified as commercially productive in culture systems. The immediate focus will be on the northern (or New England) lobster *Homarus americanus*.

Engineering Systems for Aquaculture--Develop an understanding and quantification of various processes involved in aquaculture operations and develop designs and improve systems, techniques and equipment for production, handling, harvesting and processing of aquatic biomass.

Services:

Disease diagnosis, water quality analysis, formal and informal workshops and cooperative research, information services (reprints, publications)

Funding Sources:

State appropriations, Federal (Hatch), university grants and aids, Sea Grant, NMFS, USFW, University Regents Fellowships,

Student Support: NSF, NIH predoctoral fellowships, private scholarships
Loans (through University financial aid office; limited), grants, teaching assistantships (limited), research assistantships (limited)

Faculty/Staff: Amend, D.F.; Associate Professor; Ph.D. in pathology; 100 percent time to aquaculture.

Arredondo, D.; Staff Research Assoc. I; 100 percent time to aquaculture.

Baumann, Paul; Associate Professor; Ph.D. in microbiology; 25 percent time to aquaculture.

Bordner, C.E.; SRA II; MS; 100 percent time to aquaculture.

Borgeson, W.; Senior Animal Technician; 100 percent time to aquaculture.

Botsford, L.W.; Assistant Professor; Ph.D.; 25 percent time to aquaculture.

Brown, W.D.; Professor; 25 percent time to aquaculture.

Cech, J.J., Jr.; Assistant Professor; Ph.D. in fish physiology; 25 percent time to aquaculture.

Chang, E.S.; Assistant Professor; Ph.D. in endocrinology; 100 percent time to aquaculture.

Clark, W.H. Jr.; Professor; Ph.D. in reproductive biology; 100 percent time to aquaculture.

Conklin, D.E.; Assistant Professor; Ph.D. in invertebrate nutrition; 100 percent time to aquaculture.

Conte, F.S.; Extension Aquaculturist; Ph.D; 100 percent time to aquaculture.

Crowe, J.H.; Professor; Ph.D. in invertebrate physiology/biochemistry; 25 percent time to aquaculture.

D'Bramo, L.R.; Postdoctoral; Ph.D. in nutrition, invertebrates; 100 percent time to aquaculture.

Doroshov, S.I.; Associate Professor; Ph.D. in fish biology; 100 percent time to aquaculture.

Gall, G.A.E.; Professor; Ph.D. in genetics; 100 percent time to aquaculture.

Garrett, R.E.; Professor; Ph.D. in engineering; 25 percent time to aquaculture.

Gorenzel, P.; SRA II; 12.5 percent time to aquaculture.

Hand, C.; Professor; Ph.D. in marine biology; 25 percent time to aquaculture.

Hedgecock, D.; Assistant Geneticist; Ph.D. in genetics; 100 percent time to aquaculture.

Hedrick, R.P.; Assistant Professor; Ph.D. in infectious diseases; 100 percent time to aquaculture.

Hertz, W.A.; SRA II; BS; 100 percent time to aquaculture.

Hung, S.; Assistant Professor; Ph.D. in fish nutrition; 100 percent time to aquaculture.

McDowell; Terry; SRA I; BS; 100 percent time to aquaculture.

Monaco, G.; SRA III; BS; 100 percent time to aquaculture.

Nelson, K.B.; SRA IV; BS; 100 percent time to aquaculture.

Nelson, R.T.; Lab Assistant; 100 percent time to aquaculture.

Pipkin, R.E.; SRA II; BS; 100 percent time to aquaculture.

Rosemark, T.R.; SRA II; BS; 100 percent time to aquaculture.

Walsh, W.T.; BS; Lab Assistant; 100 percent time to aquaculture.

Yudin, A.I.; SRA III; BS; 100 percent time to aquaculture.

Tuition: Resident undergraduate, \$396/quarter
Resident graduate, \$405/quarter
Non-resident undergraduate, \$1,446/quarter
Non-resident graduate, \$1,455/quarter
Tuition is waived for supported graduate students

Admission Criteria: In order of importance: Undergraduate-Grade point average, test scores (ACT, SAT, GRE), personal recommendations;
Graduate-Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications From: Undergraduate Admissions Office; 175 Mrak Hall; University of California; Davis, CA 95616

COLORADO

8. Institution: Colorado State University
Location: Fort Collins, CO
Departments/Directors: Colorado State University; Fort Collins, CO 80523
Fishery and Wildlife Biology / Dr. Robert Cook
Degrees Granted: BS, MS, Ph.D.
Current Students: 47 BS, 13 MS, 12 Ph.D.
Students Since 1970: 200 BS, 100 MS, 15 Ph.D.
Courses: Fish Culture, 4 credit hours, annually
Fish Diseases, 4 credit hours, alternate years
Fish Nutrition, 3 credit hours, alternate years
Water Quality Related to Fish Health, 2 credit hours, on demand
General Facilities: 13 earthen ponds, 0.6 ha total surface area; 6 concrete ponds/tanks, 48.6m² total surface area; 8 plastic pools, 8.6m² total surface area; 30 fiberglass tanks and troughs, 22.5m² total surface area
Specialized Facilities: Fish reproduction, fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology, hatchery technology
Cooperators: Colorado Division of Wildlife, Kansas Fish and Game Department, U.S. Fish and Wildlife Service, USAID
Services: Disease diagnosis, feed analysis, water quality analysis, short courses in aquaculture, information services (reprints, publications), consulting
Student Support: Grants, teaching assistantships, research assistantships
Faculty/Staff: Flickinger, Stephen A.; Professor; Ph.D.; experience in general

fish culture; 75 percent time to aquaculture.

Hagen, Harold; Professor; experience in general fish culture; 25 percent time to aquaculture.

Post, George; Professor; Ph.D.; experience in fish diseases and nutrition; 100 percent time to aquaculture.

Tuition:

Resident undergraduate, \$414/term

Resident graduate, \$429/term

Non-resident undergraduate, \$1,465/term

Non-resident graduate, \$1,533/term

Tuition is not waived for supported graduate students

Admission

Criteria:

In order of importance: Grade point average, personal recommendations, unusual qualifications

Applications

From:

Department of Fishery and Wildlife Biology; Wagar Building; Colorado State University; Fort Collins, CO 80523

DELAWARE

9. Institution:

Delaware State College

Location:

Dover, DE

Departments/

Directors:

Delaware State College; Dover, DE 19901; (302) 736-4929

Agriculture and Natural Resources / Dr. U.S. Washington

Degrees Granted:

Courses:

Ichthyology, 3 credit hours, alternate years

Fishery Science, 3 credit hours, alternate years

Limnology, 3 credit hours, alternate years

Aquaculture, 3 credit hours, alternate years

Fisheries Management, 3 credit hours, alternate years

Aquatic Ecology, 3 credit hours, alternate years

Soil Science, 3 credit hours, annually

General

Facilities:

30 earthen ponds, 0.4 ha total surface area; 20 concrete ponds/tanks, .02 ha total surface area; 5 cages/pens, 10m² total surface area

Specialized

Facilities:

Aquacultural water quality

Project/

Objectives:

The Resolution of Some Problems Attending the Employment of Minnows as Forage for Farmpond Fishes--Find refuges acceptable to the farmpond owner and to prey minnows but which resist incursion by the large predatory fish. Find the size of refuge needed (ratio of the pond surface) to maintain a perennial population of prey minnows in the presence of predatory fish. Determine the suitable ratio of predatory fish to prey minnows to pond area in the presence of refuges. Evaluate the production of finfish by use of minnows and refuge and by use of bluegills and no refuge.

Services:

Water quality analysis, information services (reprints, publications)

Funding Sources:

Faculty/Staff:

State appropriations, Cooperative State Research Service

Badola, Anthony, Professor; Ph.D. in hydrobiology; experience in ecology and fisheries; 50 percent time to aquaculture.

Dill, Norman H.; Professor; Ph.D. in botany; experience in ecology; 10 percent time to aquaculture.

Jones, Edward; Professor; Ph.D. in agriculture; experience in agriculture; 10 percent time to aquaculture.

Petrosky, Bernard; Research Assistant; M.S. in fisheries;

experience in fisheries; 100 percent time to aquaculture.

Wujtewicz, Donald; Research Assistant; B.S. in natural resources; experience in fisheries; 100 percent time to aquaculture.

Tuition: Resident undergraduate, \$257.50/term
Non-resident undergraduate, \$657.50/term

Admission Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications From: Delaware State College; Office of Admissions and Records; Dover, DE 19901

10. Institution: University of Delaware

Location: Newark, DE

Departments/Directors: University of Delaware; Newark, DE 19711; (302) 738-2000
Center for Mariculture Research / Dr. Ellis T. Bolton, Director
College of Marine Studies / Dr. William S. Gaither, Dean

Degrees Granted: MS, Ph.D.

Current Students: 59 MS, 31 Ph.D.

Students Since 1970: 115 MS, 28 Ph.D.

Courses: Limnology, 3 credit hours, annually
Parasitology, 3 credit hours, annually
Ichthyology, 4 credit hours, annually

General

Facilities: 6 plastic pools; 8 raceways

Specialized Facilities: Fish nutrition (shellfish), aquacultural water quality, hatchery technology, aquacultural engineering, molluscan hatchery, algal production facilities, wet laboratory
Cooperators: Rutgers, the State University of New Jersey; University of Maryland

Project/

Objectives: Emphasis on intensive controlled cultivation of marine bivalves.
Services: Disease diagnosis, feed analysis, water quality analysis, internships, information service (reprints, publications)
Funding Sources: State appropriations, university grants and aids, Sea Grant
Student Support: Loans, grants, teaching assistantships, research assistantships
Faculty/Staff: Bolton, Ellis T.; Professor; Ph.D. in mariculture and algalculture.

Carriker, Melbourne R.; Professor; Ph.D. in mariculture.

Epifanio, Charles E.; Associate Professor; Ph.D. in molluscan nutrition.

Tuition: Resident undergraduate, \$1,160/term
Resident graduate, \$940/term
Non-resident undergraduate, \$2,900/term
Non-resident graduate, \$2,540/term
Tuition is not waived for supported graduate students

Applications From: Mrs. Dorothy Woods; College of Marine Studies; University of Delaware; Newark, DE 19711

FLORIDA

- 11. Institution:** Florida Institute of Technology
Location: Jensen Beach, FL
Departments/
Directors: 1701 Indian River Drive; Jensen Beach, FL 22457; (305) 334-4200
 Ext. 665
 School of Applied Technology, Department of Environmental
 Sciences, Aquaculture Division / Randall Hogg, Department Head;
 Michael C. Hartman, Division Head
Degrees Granted: BS
Current Students: 70 BS
Students
Since 1970: 65 BS (program under way only since 1976)
Courses: Aquaculture I (introduction), 3 credit hours, twice annually
 Aquaculture II (systems), 3 credit hours, twice annually
 Aquaculture III (algae), 3 credit hours, annually
 Ichthyology, 3 credit hours
 Parasitology in Aquaculture, 3 credit hours, annually
 Aquaculture IV (crustacea), 3 credit hours, annually
 Limnology, 3 credit hours
 Aquaculture V (finfish), 3 credit hours, annually
 Fisheries Management, 3 credit hours
 Aquaculture Seminar, 3 credit hours
 Aquaculture Project, 4 credit hours, 4 times annually
 Aquaculture VI (mollusks), 3 credit hours, annually
 Practical Aquaculture, 6 credit hours, 4 times annually
General
Facilities: 24 concrete ponds/tanks, 39m² total surface area; 6 fiberglass
 pools, 61m² total surface area; 10 water tables (shallow
 tanks), 29m² total surface area
Specialized
Facilities: Fish reproduction, aquacultural water quality, hatchery
 technology, aquacultural engineering, facilities for
 spawnings/rearing mollusks, fish, and crustacea, algal culture
 facilities
Cooperators: Plymouth Poly Tech-England, several local commercial fish farms
Services: Disease diagnosis, water quality analysis, system design for
 local business consulting
Funding Sources: Private institution-student tuition
Faculty/Staff: Hartman, Michael; Assistant Professor; Ph.D. in
 invertebrate/algal symbiosis; experience in mariculture of
 mollusks, algae, and crustacea; 70 percent time to aquaculture.
 Hogg, Randall; Associate Professor; Ph.D. in exotic fishes;
 experience in aquatic biology; 50 percent time to aquaculture.
 Rae, John; Assistant Professor; Ph.D. in molluscan ecology and
 freshwater entomology; experience in shellfish biology; 25
 percent time to aquaculture.
 Stroue, Mike; Assistant Professor; M.A. in freshwater finfish
 culture; experience in catfish and Tilapia culture; 100 percent
 time to aquaculture.
Tuition: Resident undergraduate, \$69/credit hour
 Non-resident undergraduate, \$69/credit hour
Admission
Criteria: Test scores (ACT, SAT, GRE), entrance placement exams
Applications
From: Admissions Office; FIT; 1707 Indian River Drive; Jensen Beach,
 FL 33457

- 12. Institution:** Florida State University
Location: Tallahassee, FL
Departments/
Directors: Florida State University; Tallahassee, FL 32306; (904) 644-6700
 Oceanography Department / Ya Hsueh, Department Head
 Biology Department / Gibb Debusk, Department Head

Degrees Granted: MS, Ph.D.
Current Students: 3 MS, 1 Ph.D.
Students Since 1970: 7 MS, 3 Ph.D.
Courses: Mariculture, 3 credit hours, annually
 Invertebrate Zoology, 3 credit hours, annually
 Directed Individual Study, 1-6 credit hours, on demand
 Marine Biology, 3 credit hours
 Scientific Diving Techniques, 4 credit hours
 Community Ecology, 3 credit hours
 Selected Topics in Marine Biology, 1-4 credit hours
 Seminar in Marine Biology, 2 credit hours

General Facilities: Marine lab with aquaria, field mountings
Specialized Facilities: Marine lab with usual facilities
Cooperators: Florida Department of Natural Resources, University of California

Project/ Objectives: Bivalve Mollusk Culture.
Services: Information services (reprints, publications)
Funding Sources: University grants and aids, N.S.F. Sea Grant
Student Support: Hourly work, teaching assistantships, research assistantships
Faculty/Staff: Abele, Lawrence; Associate Professor; Ph.D. in biology; experience with crustaceans and zoogeography.
 Debusk, Gibb; Professor; Ph.D. in genetics; experience in research administration.
 Herrnkind, William; Professor; Ph.D. in biology; experience in crustacean behavior.
 Hsueh, Ya; Professor; Ph.D. in mechanics; experience in administration and physical oceanography.
 Livingston, Robert; Professor; Ph.D. in biology; experience in ecology.
 Mariscal, Richard; Professor; Ph.D. in biology; experience with coelenterates.
 Menzel, Robert W.; Professor; Ph.D. in marine biology; experience in marine biology (clams and oysters); 25-35 percent time to aquaculture.
 Schatten, Gerald; Associate Professor; Ph.D. in biology; experience in embryology.
 Yerger, Ralph; Professor; Ph.D. in biology; experience in ichthyology.

Tuition: Resident undergraduate, \$336/term
 Resident graduate, \$492/term
 Non-resident undergraduate, \$1,092/term
 Non-resident graduate, \$1,356/term
 Tuition is waived for supported graduate students

Admission Criteria: In order of importance: Grade point average, tests scores (ACT, SAT, GRE), personal recommendations

Applications From: Academic Coordinator; Oceanography Department; Florida State University; Tallahassee, FL 32306

13. **Institution:** University of Miami, Rosenstiel School of Marine and
Location: Atomospheric Science
Miami, FL
Departments/
Directors: University of Miami; 4600 Rickenbacker Causeway; Miami, FL
33149; (305) 350-7351
Division of Biology and Living Resources / Dr. C. Richard
Robins
Degrees Granted: MS, Ph.D., Certificate in Fisheries
Current Students: 20 MS, 10 Ph.D., 5 Certificate
Students
Since 1970: 40 MS, 20 Ph.D., 10 Certificate
Courses: Mariculture, 3 credit hours, annually
Introduction to Fishery Science, 3 credit hours, annually
Fishes and their Environment, 3 credit hours, annually
Fishery Seminar, 1 credit hour, twice annually
Fish Stocks and their Management, 4 credit hours, annually
Ecology of Marine Parasites, 4 credit hours, annually
Non-parasitic Diseases of Marine Organisms, 3 credit hours,
annually
Invertebrate Embryology, 4 credit hours, annually
Major Fisheries and Fishing Nations, 3 credit hours, annually

General
Facilities: 20 concrete ponds/tanks, 28.8m² total surface area; 40 plastic
pools, 405m² total surface area
Specialized
Facilities: Fish reproduction, aquacultural water quality, fish
pathobiology, hatchery technology, aquacultural engineering
Cooperators: National Science Foundation, Wallace Groves Aquaculture
Foundation, Noyes Foundation

Project/
Objectives: Mariculture of Dolphinfish, *Corphaena*--Develop methods to rear
dolphinfish to market size from eggs.

Artificial Propagation of the Queen Conch--Develop and test
hatchery methods for the queen conch; study released and
natural populations.

Use of Marine Blue-green Algae for Aquaculture--Test utility of
marine blue-green algae as food for finfish.

Services: Water quality analysis, information services (reprints,
publications)
University grants and aids
Funding Sources: Hourly work, teaching assistantships, research assistantships
Student Support: Iversen, Edwin S.; Professor; Ph.D. in marine biology;
Faculty/Staff: experience in fisheries, aquaculture, parasitology; 75 percent
time to aquaculture.

Lutz, Peter; Professor; Ph.D. in animal physiology; experience
in physiology of marine organisms; 25 percent time to
aquaculture.

Mitsui, Akira; Professor; Ph.D. in biochemistry; experience in
marine algae; 25 percent time to aquaculture.

Murray, Robert; Research Associate; B.S. in biology; experience
in management of penaeid and Macrobrachium hatchery; 100
percent time to aquaculture.

Schekter, Richard; Research Associate; M.S. in marine biology;
experience in larval fish culture; 100 percent time to
aquaculture.

Siddall, Scott E.; Research Assistant Professor; Ph.D. in
marine biology; experience in mariculture, hatchery methods,
invertebrates; 100 percent time to aquaculture.

Tuition: Resident graduate, \$278/credit hour
 Non-resident graduate, \$278/credit hour
 Tuition is partially waived for supported graduate students

Admission Criteria: In order of importance: Test scores (ACT, SAT, GRE), grade point average, personal recommendations

Applications From: Graduate Studies Office; RSMAS; 4600 Rickenbacker Causeway; Miami, FL 33149

14. Institution: University of West Florida
Location: Pensacola, FL
Departments/Directors: University of West Florida; Pensacola, FL 32504; (904) 476-9500
 Biology / Dr. Peggy Winter
Degrees Granted: MS
Current Students: 30 MS (3 on aquacultural problems)
Students Since 1970: 60 MS (10 on aquacultural problems)
Courses: Aquaculture
General Facilities: 3 earthen ponds, 300m2 total surface area; several plastic pools; several cages/pens
Specialized Facilities: Lugworm culture facility
Cooperators: MAP, EPA
Project/Objectives: Lugworm Aquaculture Studies--Feeding, growth, harvesting, predator control, and marketing.
Services: Information services (reprints, publications)
Funding Sources: University grants and aids, Sea Grant, EPA
Student Support: Loans, grants, hourly work, teaching assistantships
Faculty/Staff: Dipano, Charles; Professor; Ph.D. in gastropod culture; experience in lugworm culture; 25 percent to aquaculture
Tuition: Resident undergraduate, \$28/credit hour
 Resident graduate, \$38/credit hour
 Non-resident undergraduate, \$91/credit hour
 Non-resident graduate, \$110/credit hour
 Tuition is not waived for supported graduate students

Admission Criteria: In order of importance: grade point average, test scores, personal recommendation

Applications From: Dept. of Biology; University of West Florida; Pensacola, FL 32504

GEORGIA

15. Institution: University of Georgia
Location: Athens, GA
Departments/Directors: University of Georgia; Athens, GA 30602; (404) 542-3473
 College of Veterinary Medicine, Department of Medical Microbiology / Dr. John B. Gratzek
Degrees Granted: MS, Ph.D.
Current Students: 35 MS, 20 Ph.D.
Students Since 1970: 4 MS, 4 Ph.D.
Courses: Diseases of Cultured Fish, 5 credit hours, alternate years
General Facilities: 100 controlled recirculating aquaria

Specialized Facilities: Aquacultural water quality, fish pathobiology
Cooperators: Monies from State of Georgia, Sea Grant on ichthyological immunity, Private: Joint Advisory Group
Project/ Objectives: Effects of Environmental Contaminants on Georgia Farm Pond Fishes--Refine an adenylate (ATP, ADP, AMP) assay procedure for determining energy charge (ATP + 1/2 ADP divided by ATP + ADP + AMP) in farm pond fishes. Test the applicability of energy charge as a sensitive indicator of stress caused by various contaminants and water quality parameters associated with agricultural and forestry practices. Determine the capacity of farm pond fishes to acclimate to changes in pH.
Services: Disease diagnosis, feed analysis, pesticide analysis, water quality analysis, special in-service training for foreign students, information services (reprints, publications)
Funding Sources: State appropriations, Federal (Hatch), industry
Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships
Faculty/Staff: Dawe, D.L.; Professor; DVM and Ph.D. in immunology; experience in immunology; 20 percent time to aquaculture.
 Gratzek, J.B.; Professor; DVM and Ph.D. in virology; experience in virology and parasitology culture systems; 20 percent time to aquaculture.
 Shotts, E.B.; Professor; Ph.D. in immunology; experience in immunology; 20 percent time to aquaculture.
Tuition: Resident graduate, \$800/term
 Non-resident undergraduate, \$1,400/term
 Tuition is waived for supported graduate students
Admission Criteria: In order of importance: Grade point average, test scores (ACT, SAT, GRE), personal recommendations
Applications From: Graduate College; University of Georgia; Athens, GA 30602

HAWAII

16. Institution: University of Hawaii at Manoa
Location: Honolulu, HI
Departments/ Directors: University of Hawaii at Manoa; 3050 Maile Way; Honolulu, HI 96822; (808) 948-8154
 Agricultural Engineering Department / Dr. Jaw-Kai Wang
Degrees Granted: MS
Current Students: 2 MS
Students Since 1970: 6 MS
General Facilities: Aquacultural Engineering Laboratory
Specialized Facilities: Aquacultural engineering
Cooperators: Commercial farmers in the state
Project/ Objectives: Prawn Aquacultural Engineering--Design and develop sizing and grading technologies. Design and develop more efficient harvesting technology. Develop pond maintenance procedures and equipment. Develop live transport systems.
 Study of Manure-Enriched Food Webs in Marine Pond Ecosystems--Obtain analytical data on the physical, chemical, nutrient, and trophic cycles of manure-enriched marine ponds. Develop pond-management techniques for working with

manure-enriched marine ponds. Evaluate the economic potential of using marine-enriched food webs for application to a marine-shrimp-production industry.

Oyster Production Equipment Development--Develop a system for flushing and cleaning stacked oyster trays of pseudofeces, ideally without breaking open the stacks.

Aquacultural Wastewater Management and Utilization in Hawaii--Characterize effluent quality (organics and inorganics) of aquacultural pond; determine the role of oxygen demand in the water column of the pond, explore the appropriate control of oxygen concentration in the pond, explore the appropriate treatment alternatives in order to control water quality and water reuse of pond effluent.

Services: Information services (reprints, publications), engineering extension
Funding Sources: Sea Grant and State Aquaculture Development Program Grant
Student Support: Grants
Faculty/Staff: Gantz, Loren; Research Associate; M.S. in agricultural engineering; experience in freshwater prawn culture system design and management; 100 percent time to aquaculture.

Wang, Jaw-Kai; Professor; Ph.D. in agricultural engineering; experience in freshwater prawn culture systems design and management; 20 percent time to aquaculture.

Tuition: Resident graduate, \$275/term
Non-resident graduate, \$687.50/term
Tuition is waived for supported graduate students

Admission
Criteria: Grade point average

Applications
From: Dr. Jaw-Kai Wang; Agricultural Engineering Department, University of Hawaii at Manoa; 3050 Maila Way; Honolulu, HI 96822

17. **Institution:** University of Hawaii
Location: Honolulu, HI
Departments/
Directors: University of Hawaii; Honolulu, HI 96822; (808) 948-7633
Oceanography / Edward Stroup
Degrees Granted: MS, Ph.D.
Current Students: 31 MS, 17 Ph.D.
Students
Since 1970: 24 MS, 24 Ph.D.
Courses: Aquaculture Production, 3 credit hours, annually
General
Facilities: 12 earthen ponds, 0.24 ha total surface area
Specialized
Facilities: Fish processing technology, aquacultural water quality, microbial ecology
Cooperators: Anuenue Fisheries Research Center
Project/
Objectives: Water Quality Control in Freshwater Prawn Ponds--Investigate the use of fishes and aquatic plants in freshwater prawnponds to conserve water, allow for more efficient use of nutrients in applied feeds, and improve on the quality of discharged water. Carry out a program of assessment of the major biological and chemical indices of water quality in experimental pounds to best evaluate the impact of treatment.
- Prawn Aquaculture Program-Biological Basis of Production--Aid the development of an improved feed and better feed management; aid the development of management strategies for crises

associated with low oxygen levels in ponds; test management strategies emphasizing the pattern of growth (observed size-frequency distribution) in pond populations of prawns; contribute to the controlled domestication of prawns; and aid the development of alternative stocking and harvesting strategies and management systems.

Services: Information services (reprints, publications)

Funding Sources: USDA, Sea Grant

Student Support: Grants, teaching assistantships, research assistantships

Faculty/Staff: Laws, Edward; Associate Professor; Ph.D. in physical chemistry; experience in phytoplankton ecology; 30 percent time to aquaculture.

Tuition: Resident undergraduate, \$225/term
Resident graduate, \$275/term
Non-resident undergraduate, \$562.50/term
Non-resident graduate, \$687.50/term

Admission Criteria: In order of importance: Personal recommendations, test scores (ACT, SAT, GRE) grade point average

Applications From: University of Hawaii; Oceanography Department; Honolulu, HI 98622

18. Institution: University of Hawaii

Location: Honolulu, HI

Departments/Directors: University of Hawaii; 3190 Maile Way; Honolulu, HI 96827; (808) 948-8369
Botany / Dr. S.M. Siegel

Degrees Granted: MS, Ph.D.

Current Students: 3 MS, 4 Ph.D.

Students Since 1970: 4 MS, 8 Ph.D.

Courses: Phycology, 3 credit hours, annually
Cyanophyta and Phaeophyta, 2 credit hours, once in four years
Chlorophyta, 2 credit hours, once in four years
Phytoplankton Groups, 2 credit hours, once in four years
Rhodophyta, 2 credit hours, once in four years
Phytoplankton Taxonomy, 4 credit hours, alternate years
Marine Agronomy, 4 credit hours, alternate years

General Facilities: 4 earthen ponds, 100 acres total surface area; reef flats

Specialized Facilities: Fish feed technology, aquacultural engineering, reef flat farming, and algal culture in ponds

Cooperators: Aquaculture Development Program of DLNR, Division of Aquatic Resources, Hawaii Institute of Tropical Agriculture and Human Resources, Sea Grant, FAO, industry

Project/Objectives: Introduction of Eucheuma Farming in Ponape.

Introduction of Gracilaria Farm Production in Hawaii.

Improvement of OGO Production and Marketing in Hawaii--Inventory the current OGO (Gracilaria) industry, its problems and potentials.

Funding Sources: Development agency contracts, Federal (Hatch), university grants and aids, Sea Grant, industry, foreign governments

Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Doty, M.S.; Professor; Ph.D. in marine biology; experience in algae, seaweed production, reef flat farming, seaweed farming; 50 percent time to aquaculture.

Santos, G.A.; APT; Ph.D. in chemistry; experience in natural products of algae, seaweed chemistry, hydrocolloids, algal colloids; 100 percent time to aquaculture.

Tuition: Tuition is waived for supported graduate students

Admission Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications From: Graduate Student Admissions Office; University of Hawaii; Honolulu, HI 96822

ILLINOIS

19. Institution: Southern Illinois University

Location: Carbondale, IL

Departments/Directors: Southern Illinois University; Carbondale, IL 62901; (618) 536-7761
Fisheries Research Laboratory / Dr. William M. Lewis, Director; Dr. Roy C. Heidinger, Assistant Director

Degrees Granted: MS, Ph.D.

Current Students: 10 MS, 4 Ph.D.

Students Since 1970: 45 MS, 10 Ph.D.

Courses: Freshwater Invertebrates, 4 credit hours, annually
Aquatic Entomology, 3 credit hours, annually
Limnology, 3 credit hours, annually
Ichthyology, 3 credit hours, annually
Fish Management, 3 credit hours, annually
Fish Culture, 3 credit hours, annually
Advanced Limnology, 3 credit hours, annually
Techniques of Fish Culture and Management, 4 credit hours, on demand
Seminar in Fish Culture, 3 credit hours, alternate years
Seminar in Fish Management, 3 credit hours, alternate years
Energetics of Aquatic Ecosystems, 2 credit hours, annually

General Facilities: 18 earthen ponds, 4 ha total surface area; 3 large recirculating systems

Specialized Facilities: Aquacultural water quality, fish pathobiology, hatchery technology

Cooperators: Illinois Department of Conservation, Dingell-Johnson funds, USDA

Project/Objectives: Walleye Tank Culture Techniques--Advance the tank culture of walleye.

Use of Hybrid Sunfish in Illinois Farm Ponds--Examine the potential of hybrids of reduced fecundity in management of farm ponds.

Use of Distillers Solubles in Aquaculture

Services: Information services (reprints, publications)

Funding Sources: State appropriations, university grants and aids, power industry and funding through Dingell-Johnson

Student Support: Grants, research assistantships

Faculty/Staff: Burr, Brooks; Associate Professor; Ph.D.

Heidinger, Roy C.; Professor; Ph.D.

Kohler, Christopher C.; Research Associate; Ph.D.

Lewis, William M.; Professor; Ph.D.

Tuition: Tetzlaff, Bruce; Research Project Director; M.A.
Resident graduate, \$525/term
Non-resident graduate, \$1,228/term
Tuition is waived for supported graduate students.

Admission
Criteria: Grade point average, test scores (GRE)

Applications
From: Director of Graduate Studies; Department of Zoology; Southern Illinois University; Carbondale, IL 62901

INDIANA

20. Institution: Purdue University
Location: West Lafayette, IN
Departments/
Directors: Purdue University; West Lafayette, IN 47907; (317) 494-8391
Forestry and Natural Resources / Dr. M.C. Carter
Animal Science / Dr. W.R. Woods
Botany and Plant Pathology / Dr. T.K. Hodges
Entomology / Dr. E.E. Ortman

Degrees Granted: MS, Ph.D.
Current Students: 7 MS, 3 Ph.D.
Students
Since 1970: 35 MS, 10 Ph.D.
Courses: Ichthyology, 3 credit hours, annually
Limnology, 3 credit hours, annually
Fisheries Biology, 4 credit hours, annually
Aquaculture, 3 credit hours, annually
Principles of Animal Breeding, 3 credit hours, twice annually
Animal Cytogenetics, 2 credit hours, annually
Aquatic Botany, 3 credit hours, annually
Aquatic Entomology, 3 credit hours, annually

General
Facilities: 20 earthen ponds, 3.6 ha total surface area; 1 raceway, 34,200 liters; 9 cages/pens, 1 cubic meter; 22 fiberglass tanks, 760-2280 liters

Specialized
Facilities: Fish reproduction, aquacultural water quality, fish cytogenetics, intensive culture systems

Cooperators: Department of Fish and Wildlife, U.S. Department of Agriculture, Agricultural Experiment Station

Project/
Objectives: Feasibility of Producing Catfish in Indiana--Determine optimum stocking, feeding, harvesting for Indiana ponds; develop cage culture of blue and channel catfish; develop intensive culture systems using recirculating water.

Fish Cytogenetics and Breeding--Study induced triploidy in channel catfish; study induced triploidy in white X channel catfish; develop techniques for chromosomal analysis in catfish.

Fish Toxicology--Determine response of catfish to various levels of ammonia; determine mechanism of ammonia toxicity in fish.

Services: Reprints, publications

Funding Sources: State appropriations, Federal (Hatch), university grants and aids, competitive grants and contracts

Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Chrisman, Charles L.; Professor; Ph.D. in animal cytogenetics; experience in fish cytogenetics; 30 percent time to

aquaculture.

Lembi, Carole; Associate Professor; Ph.D. in aquatic botany; experience in aquatic botany; 40 percent time to aquaculture.

Libey, George S.; Associate Professor; Ph.D. in fish population dynamics; experience in pond culture, breeding and intensive culture units; 70 percent time to aquaculture.

McCafferty, William P.; Associate Professor; Ph.D. in aquatic entomology; experience in aquatic entomology; 40 percent time to aquaculture.

Spacie, Anne; Associate Professor; Ph.D. in aquatic toxicology; experience in aquatic toxicology; 40 percent time to aquaculture.

Tuition: Resident undergraduate, \$2,140/term
Resident graduate, \$2,140/term
Non-resident undergraduate, \$3,249/term
Non-resident graduate, \$3,249/term
Tuition is waived for supported graduate students

Admission Criteria: In order of importance: Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications From: Director of Admissions; Hovde Hall of Administration; Purdue University; West Lafayette, Indiana 47907

IOWA

- 21. Institution:** Iowa State University
Location: Ames, IA
Departments/Directors: Iowa State University; Ames, IA 50011
Animal Ecology / Dr. Robert C. Summerfelt
BS, MS, Ph.D.
Degrees Granted: 63 BS, 10 MS, 6 Ph.D. (only 2 in aquaculture)
Current Students: Fisheries and Limnological Tech., 2 credit hours, annually
Courses: Fishery Management, 2 credit hours, annually
Fish Culture, 3 credit hours, alternate years
Seminar in Fish Culture, 1 credit hour, annually
Advanced Fishery Management, 3 credit hours, annually
Aquatic Toxicology and Hazard Evaluation, 3 credit hours, annually
Fish Health Management, 3 credit hours, alternate years
Marine Aquaculture, 6 credit hours, annually
- General Facilities:** 8 fiberglass tanks, 64 ft² total surface area; 10 aquaria, 20 ft² total surface area
- Specialized Facilities:** Fish nutrition (larval fish), fish pathobiology, hatchery technology (hatching jars)
- Cooperators:** Iowa Conservation Commission, Gulf Coast Research Laboratory (Mississippi)
- Project/Objectives:** Intensive Culture of Walleyes--Feeding of walleye fry.
Chemical Separation and Jar Incubation of Channel Catfish Eggs--Develop a technique for separating channel eggs from the gelatinous matrix.
- Services:** Workshops (topic varies--the last one was on fish diseases), information services (reprints, publications)
- Funding Sources:** University grants and aids, Sea Grant, Iowa Conservation Commission

Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships, scholarships

Faculty/Staff: Atchison, Gary J.; Associate Professor; Ph.D. in fisheries biology; experience in aquatic toxicology, water quality requirements of fish, effects of pesticides and heavy metals on fish, behavior; 30 percent time to aquaculture.

Hubert, Wayne A.; Assistant Professor; Ph.D. in fisheries; experience in fisheries biology, aquaculture, fish diseases; 25 percent time to aquaculture.

Menzel, Bruce W.; Professor; Ph.D. in zoology, fisheries, ichthyology; experience in fish biology, reproductive biology, ecology; 30 percent time to aquaculture.

Nickum, John G.; Associate Professor; Ph.D. in zoology, fisheries biology; experience in fisheries biology, aquaculture; 50 percent time to aquaculture.

Summerfelt, Robert C.; Professor; Ph.D. in zoology, fisheries biology, microbiology; experience in fisheries biology, fish culture, fish diseases; 10 percent time to aquaculture.

Tuition: Resident undergraduate, \$520/semester
Resident graduate, \$600/semester
Non-resident undergraduate, \$1,290/semester
Non-resident graduate, \$1,400/semester
A scholarship credit is given for one-half of resident tuition of supported graduate students.

Admission Criteria: In order of importance: Grade point average, test scores (ACT, SAT, GRE), personal recommendations, experience and personal letter indicating areas of interest and compatibility with interests of professor

Applications From: Department of Animal Ecology; Iowa State University; Ames, Iowa 50011

KANSAS

22. Institution: Kansas State University

Location: Manhattan, KS

Departments/Directors: Kansas State University; Manhattan, KS 66506; (913) 532-6615
Division of Biology / Dr. Terry C. Johnson, Director

Degrees Granted: BS, MS, Ph.D.

Current Students: 20 BS

Students Since 1970: 79 BS, 6 MS, 2 Ph.D.

Courses: Ichthyology, 3 credit hours, annually
Fisheries Management, 4 credit hours, annually
Limnology, 4 credit hours, annually
Aquaculture, 3 credit hours, alternate years
Lower Plants, 3 credit hours, alternate years

General Facilities: 28 earthen ponds, 2.8 ha total surface area; 16 plastic pools; 20 private farm ponds, 6 ha total surface area

Specialized Facilities: Fish nutrition, fish feed technology, hatchery technology, aquacultural engineering

Cooperators: Kansas Fish and Game Commission, Kansas Commercial Fish Growers Association

Project/Objectives: Host-Parasite Relationships Between the Channel Catfish and Ichthyophthirius multifiliis--Develop methods for maintaining I.

multifilis by cryopreservation; determine presence of a carrier state of this parasite on fish surfaces and develop an ELISA for detection of the parasite; evaluate host resistance mechanisms and attempt to develop a means of immunization of catfish.

Services: Information services (reprints, publications), informal consultation

Funding Sources: State appropriations

Student Support: Hourly work, teaching assistantships, research assistantships

Faculty/Staff: Behnke, Keith C.; Assistant Professor; Ph.D. in grain science; experience in feed technology, feed processing and animal nutrition.

Klaassen, Harold E.; Associate Professor; Ph.D. in fisheries biology; experience in fisheries management, pond management and catfish feeding; 20 percent time to aquaculture.

Marzolf, Richard G.; Professor; Ph.D. in limnology; experience in water quality and plankton production.

Tuition: Resident undergraduate, \$449/term
Resident graduate, \$449/term
Non-resident undergraduate, \$1,107/term
Non-resident graduate, \$1,107/term
Out-of-state tuition is waived for supported graduate students

Admission Criteria: In order of importance for graduate student admission: Grade point average, personal recommendations, test scores (ACT, SAT, GRE); no criteria for undergraduate admission

Applications From: Division of Biology; Kansas State University; Manhattan, KS 66506

LOUISIANA

23. Institution: Louisiana State University and A and M College

Location: Baton Rouge, LA

Departments/Directors: Baton Rouge, LA 70803; (504) 388-4131
School of Forestry and Wildlife Management / Thomas Hansbrough, Director

Degrees Granted: MS, Ph.D.

Current Students: 15 MS

Students Since 1970: 102 MS (in Fisheries), 4 Ph.D.

Courses: Principles of Aquaculture, 3 credit hours, spring semester annually
Advanced Aquaculture, 3 credit hours, summer semester annually
Diseases of Marine and Aquatic Animals, 3 credit hours, spring semester annually
Limnology, 3 credit hours
Fish Parasites and Diseases, 3 credit hours
Fishery Research Techniques, 3 credit hours, annually
Ichthyology, 3 credit hours
Fisheries Hydrography, 3 credit hours, alternate years
Shellfisheries Biology, 3 credit hours, alternate years
Water Pollution Biology, 3 credit hours, annually

General Facilities: 152 earthen ponds; 6 concrete ponds/tanks; 36 plastic pools, 7m² total surface area; 12 cages/pens, 12m² total surface area.

Specialized Facilities: Fish reproduction, aquacultural water quality, fish pathobiology, hatchery technology, aquacultural engineering, amphibian lab

Cooperators: LA Department of Wildlife and Fisheries, S-168, Sea Grant, NIH,

**Project/
Objectives:**

Crawfish Farmers, Auburn Catfish Breeding, Israel

Recovery and Utilization of Shrimp and Crawfish Processing By-products.

Formulation of Foods for Aquatic Animals of Economic Importance.

Laboratory Culture for Research Purposes of Estuarine and Marine Lobsters, Crabs, and Shrimps--Rear decapod larvae (lobsters, crabs, and shrimps) of as many Louisiana species as possible, from egg through postlarval stages under defined laboratory conditions. Describe and illustrate the developmental stages of each species reared. Compare laboratory reared larvae with corresponding larvae taken in the plankton.

Warmwater Aquaculture--Develop improved methods for harvesting crawfish. Develop techniques for culturing freshwater shrimp and other marginally successful species. Study the effect of aeration on water quality and fish production. Improve crawfish and fish stocks through breedings. Study use of forage combinations, agricultural by-production. Study pathogenesis and immunology of fish and crawfish.

Production and Utilization of Aquatic Plants in an Aquaculture-Agricultural-Waste Management System--Develop methods of harvesting, transporting, processing, and preserving aquatic plants (Lemnaceae). Use of the plants as a protein supplement for animal stocks. Determine the value of the plants for processing lagooned animal waste. Determine the value of lagoon sediment and water as a nutrient supplement for animal stocks and crops.

Mechanization of Crawfish Harvesting and Production--Develop one or more methods to mechanically harvest crawfish. Mechanize and develop aeration, water management, and other systems for crawfish production.

Development of Methods for Mass Production and Management of Bullfrogs--Determine the effects on tadpoles of diet and water quality. Development of pelleted diets for bullfrogs. Determine methods of disease control in tadpoles and bullfrogs. Effect of environmental factors and hormone injections on controlled reproduction. Influence of selective breeding on improved growth, acceptance of artificial foods, and other useful characteristics.

Management Techniques for Increasing Crawfish Production--Develop better methods of harvesting crawfish. Develop forage/feeding schemes to maximize crawfish yields. Multiple crop crawfish with rice, soybeans, and other crops on the same lands. Improve methods of maintaining optimum water quality.

Effects of Environmental Conditions and Management Practices on Commercial Production of Crawfish--Delineate the major environmental factors that regulate production of crawfish in commercial ponds. Develop management strategies that optimize economic yields of crawfish from commercial ponds. Evaluate new management techniques developed by the Louisiana agricultural experiment station in commercial crawfish ponds.

Services:

Disease diagnosis, feed analysis, pesticide analysis, water quality analysis, information services (reprints, publications)

Funding Sources:

State appropriations, Federal and private grants

Student Support:

Hourly work, research assistantships

Faculty/Staff:

Avault, J.W.; Professor; Ph.D. in fisheries; experience in

aquaculture; 74 percent time to aquaculture.

Culley, D.D.; Professor; Ph.D. in zoology; experience in aquaculture; 79 percent time to aquaculture.

Edling, R.J.; Associate Professor, Ph.D. in agricultural engineering; experience in water management and irrigation; 10 percent time to aquaculture.

Romaine, R.P.; Assistant Professor; Ph.D. in fisheries; experience in aquaculture; 100 percent time to aquaculture.

Tuition: Resident undergraduate, \$342/term

Resident graduate, \$342/term

Non-resident undergraduate, \$857/term

Non-resident graduate, 642/term

Tuition is waived for supported graduate students

Admission

Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications

From: Office of Admissions; 135 Thomas Boyd Hall; Louisiana State University; Baton Rouge, Louisiana 70803

24. Institution: Louisiana State University

Location: Baton Rouge, LA

Departments/

Directors: Louisiana State University; Baton Rouge, LA 70803

Veterinary Science / Kirklyn M. Kerr

Veterinary Microbiology and Parasitology / T. Bonner Stewart (Acting)

Degrees Granted: MS, Ph.D. (Veterinary Microbiology and Parasitology)

Current Students: 2 MS

Courses: Diseases of Aquatic Animals, annually

Specialized

Facilities: Fish pathobiology (wet and dry lab)

Cooperators: S-168

Project/

Objectives: Biology and Control of Aquatic Animal Diseases--General fish pathology; research at present concerns disease in commercial crawfish ponds.

Aeromonas Hydrophila Exotoxins--Study the contribution of exotoxins to the virulence and pathogenesis of motile aeromonad septicemia and examine their potential as immunogens.

Services: Disease diagnosis, water quality analysis

Funding Sources: State appropriations, Federal (Hatch), university grants and aids

Student Support: Grants, research assistantships

Faculty/Staff: Thune, Ronald L.; Ph.D. in fish diseases; experience in fish diseases, immunology, bacteriology; 100 percent time to aquaculture.

Admission

Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications

From: Graduate Chairman; Department of Veterinary Microbiology and Parasitology; School of Veterinary Medicine; Louisiana State University; Baton Rouge, Louisiana 70803

25. Institution: Louisiana State University
Location: Baton Rouge, LA
Departments/
Directors: Louisiana State University; Baton Rouge, LA 70803
Food Science / Auttis M. Mullins
Degrees Granted: BS, MS, Ph.D
Current Students: 12 BS, 17 MS, 10 Ph.D.
Students
Since 1970: 62 BS, 99 MS, 51 Ph.D.
Courses: Marine Food Resource and Technology
Specialized
Facilities: Fish processing technology, fish nutrition, fish feed
technology, processing waste utilization
Cooperators: Louisiana State Wildlife and Fisheries, State Department of
Agriculture, Seafood Industries, FDA, DOI, DOC, USDA, NSF,
Texas A and M, Auburn University, Mississippi University, US
FWS, AID, FAO, several foreign governments, NMFS, Seattle, and
Galveston
Services: Disease diagnosis, feed analysis, pesticide analysis, water
quality analysis, information services (reprints, publications)
Funding Sources: State appropriations, university grants and aids, industry
Student Support: Loans, grants, hourly work, research assistantships
Faculty/Staff: Meyers, S.P.; Professor; Ph.D. in botany and microbiology;
experience in food processing; 30 percent time to aquaculture.
Tuition: Resident undergraduate, \$331/term
Resident graduate, \$331/term
Non-resident undergraduate, \$846/term
Non-resident graduate, \$631/term
Tuition is waived for supported graduate students
Admission
Criteria: Grade point average, test scores (ACT, SAT, GRE)
Applications
From: Admissions Office; Louisiana State University; Baton Rouge, LA
70803

MICHIGAN

26. Institution: Michigan State University
Location: East Lansing, MI
Departments/
Directors: Department of Fisheries and Wildlife; 13 Natural Resources
Building; Michigan State University; East Lansing, MI 48824;
(517) 355-4477
Fisheries and Wildlife / Dr. Niles R. Kevern
Degrees Granted: BS, MS, Ph.D. in Fisheries and Wildlife
Current Students: 75 BS, 25 MS, 12 Ph.D. (fisheries degrees)
Students
Since 1970: 240 BS, 150 MS, 35 Ph.D. (fisheries degrees)
Courses: Fish Culture, 3 credit hours, annually
Aquaculture, 3 credit hours, annually
Fish Diseases, 3 credit hours, upon request
Introductory Limnology, 3 credit hours, annually
Limnology, 3 credit hours, annually
Limnological Methods, 3 credit hours, annually
Ichthyology, 3 credit hours, annually
Environmental Requirements of Fishes, 3 credit hours, alternate
years
Advanced Biological Limnology, 3 credit hours, alternate years
Chemical Limnology, 4 credit hours, annually
Applied Limnology, 3 credit hours, annually
General
Facilities: 4 earthen ponds; 20 concrete ponds; 15 cages; assorted
fiberglass tanks and aquaria housed in labs listed below

Specialized Facilities: Fish processing technology, fish nutrition, aquacultural water quality, fish pathobiology, hatchery technology

Cooperators: MI DNR, Fish Division, Hatchery Section, Cooperative Extension Service, Sea Grant, Consortium for International Fisheries and Aquaculture Development (CIFAD)

Project/ Objectives: Use of Steroid Hormone Supplements in Rainbow Trout Culture.

Effect of Dietary pH on Rainbow Trout Growth.

Coolwater Fish Diet Acceptability.

Nutrient Requirements of Tilapia Species Indigenous to Egypt.

US AID Title XII, Technical Advisory Committee Participation.

US AID Title XII, Efficiency of Pond Culture Systems: Principles and Practices, Indonesia Project.

Farm Fish Pond Management--Estimate production of plants and animals per unit area or volume of water in farm type ponds and natural ponds. Determine extent fertilization of ponds will increase production of fish food (plankton, insects) and fish. Devise practical management programs for farm ponds; this includes the number of fish to plant and harvest. Detect and measure possible detrimental effects of use of fertilizers in fish ponds.

Services: Planning for Commercial Aquaculture, workshop offered yearly, information services (reprints, publications), aquatic weed identification

Funding Sources: State appropriations, Federal (Hatch) and Sea Grant, university grants and aids

Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships (foreign students accepted into our program must have total support from their government)

Faculty/Staff: Booren, Alden; Assistant Professor; Ph.D. in food science; experience in fish processing; 20 percent time to aquaculture.

Cooper, Bixby; Associate Professor; Ph.D. in marketing; experience in aquacultural marketing; 5 percent time to aquaculture.

Fromm, Paul; Professor; Ph.D. in physiology; experience in fish physiology; 5 percent time to aquaculture.

Garling, Donald L. Jr.; Assistant Professor; Ph.D. in fish nutrition and aquaculture; experience in biochemical and physiological aspects of fish nutrition; 95 percent time to aquaculture.

Harte, Bruce, Assistant Professor; Ph.D. in packaging; experience in fish packaging; 5 percent time to aquaculture.

Heldman, Dennis; Professor; Ph.D. in agricultural engineering; experience in fish processing mechanization; 5 percent time to aquaculture.

Hoffert, Jack; Professor; Ph.D. in physiology; experience in fish physiology; 5 percent time to aquaculture.

Kevern, Niles R.; Professor and Department Head; Ph.D. in limnology and fisheries; experience in utilization of rough fish; 10 percent time to aquaculture.

King, Darrell L.; Professor; Ph.D. in limnology and fisheries;

experience in pond and lake nutrient flow; 25 percent time to aquaculture.

McNabb, Clarence; Professor; Ph.D. in limnology; experience in aquaculture and aquatic plants.

Muzzall, Patrick; Assistant Professor; Ph.D. in parasitology; experience in fish diseases; 10 percent time to aquaculture.

Person, Howard; Professor; Ph.D. in agricultural engineering; experience in aquaculture systems; 5 percent time to aquaculture.

Trapp, Allan; Professor; DVM; experience in fish pathology and diagnostics; 5 percent time to aquaculture.

Zehner, Mary; Specialist; Ph.D. in agricultural economics; experience in aquacultural marketing; 5 percent time to aquaculture.

Tuition: Resident undergraduate, \$407.50 (100 and 200 level)/term
Resident undergraduate, \$449.50 (300 and 400 level)/term for 12 hours
Resident graduate, \$406/term for 9 hours
Non-resident undergraduate, \$881.50 (100 and 200 level)/term for 12 hours
Non-resident undergraduate, \$905.50 (300 and 400 level)/term for 12 hours
Non-resident graduate, \$752.50/term for 9 hours
Out-of-state tuition is waived for supported graduate students

Admission

Criteria: In order of importance: Grade point average, personal recommendations, test scores (GRE), availability of advisor

Applications

From: Office of Admissions and Scholarships; Michigan State University; East Lansing, MI 48824

MISSISSIPPI

27. Institution: Mississippi State University

Location: Mississippi State, MS

Departments/

Directors: Mississippi State University; Mississippi State, MS 39762; (601) 325-2131

Agricultural Economics / Dr. Verner G. Hurt

Animal Health Research / Dr. Richard J. Hidalgo

Wildlife and Fisheries / Dr. Dale H. Arner

Delta Branch Experiment Station / Dr. C.G. Shepherd

Agricultural and Biological Engineering / Dr. William R. Fox

Biochemistry / Dr. Robert P. Wilson

Horticulture / Dr. Clyde C. Singletary

BS, MS, Ph.D.

Degrees Granted: 15 BS, 4 MS, 5 Ph.D.

Current Students:

Students

Since 1970: 33 MS, 3 Ph.D.

Courses:

Applied Aquatic Ecology, 3 credit hours, annually

Fish Culture, 3 credit hours, alternate years

Parasites of Game and Fish, 3 credit hours, annually

Fish Physiology, 3 credit hours, alternate years

Fishery Techniques, 2 credit hours, annually

Limnology, 3 credit hours, annually

Fishery Biology, 3 credit hours, annually

Poultry and Catfish Marketing, 1 credit hour, annually

General

Facilities: 61 earthen ponds, 19.4 ha total surface area; 60 concrete

ponds/tanks; 80 aquaria

Specialized Facilities: Fish processing technology, fish reproduction, fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology, hatchery technology, aquacultural engineering, water quality bioassay

Cooperators: Cooperative Extension Service, Catfish Farmers of Mississippi, Southern Association of Experiment Station Directors, Tennessee Valley Authority, USDA, Mississippi Farm Bureau

Project/ Objectives:

Determination of Digestible Energy Values of Feedstuffs for Channel Catfish--Determine the digestible energy values of several feed ingredients commonly used in commercial catfish feeds.

The Potentiated Sulfonamide, R05-0037, for Therapy and Bacterial Infection in Channel Catfish--Determine the efficacy of the potentiated sulfonamide R05-0037 against bacterial infections in channel catfish; cooperate in the application procedure for submission of R05-0037 for registration for use in channel catfish.

Warmwater Aquaculture--To develop and advance methods required for economic rearing, processing, and marketing of warmwater aquatic animals with economic potential.

Water Quality, Stocking Rates, and Harvesting Systems for Catfish--Estimate production function for stocking rates on methods in ponds; compute net returns; develop and publish recommendations.

Channel Catfish Nutrition--Determine the protein digestibility and amino acid availability in various foodstuffs for channel catfish and test these at least-cost rations; test various foodstuffs for potential antinutritional factors for channel catfish; determine the mineral requirements for channel catfish; investigate various biochemical or metabolic parameters in the catfish as they may be influenced by diet or nutritional status.

Winter Feeding of Channel Catfish in Mississippi--Evaluate growth rates, catfish winter feeding programs.

Practical Food Formulations and Feeding Practices for Catfish Farming in Mississippi--Evaluate the practical application of computer-derived least-cost ration formulations in catfish production ponds; compare experimental rations developed from the most current catfish nutrition information available to a standard commercial ration used throughout the industry; evaluate any effects of peanut meal as a feed ingredient on the shelf life of processed fish; evaluate diet formulation for winter feeding regimes in catfish production ponds.

Mirex Feeding Study in Channel Catfish (*Ictalurus punctatus*)--Evaluate the effects of long-term feeding of mirex to channel catfish; evaluate the experimental protocol for future similar studies.

Methemoglobinemia in Channel Catfish--Develop effective and economic treatments for brown blood disease in channel catfish.

Detection of Latent Channel Catfish Virus Infection--Develop a monoclonal antibody system for channel catfish virus; evaluate monoclonal antibody reagents for usefulness in detecting latent channel catfish infections.

Off-Flavor in Pond-Raised Catfish--Develop methodology to identify off-flavor producing compounds in pond-raised catfish; develop analytic methods for determination of off-flavor; evaluate the analytic methods for usefulness in predicting off-flavor.

Services: Disease diagnosis, feed analysis, pesticide analysis, water quality analysis, in-service training for persons from outside our institution in cooperation with Extension Service, information services (reprints, publications)

Funding Sources: State appropriations, Federal grants

Student Support: Grants, hourly work, research assistantships

Faculty/Staff: Ainsworth, A.J.; Assistant Professor; Ph.D. in immunology; experience same as degree; 25 percent to aquaculture.

Ammerman, Gale R.; Professor; Ph.D. in food technology; experience same as degree; 10 percent to aquaculture.

Beleau, M.H.; Associate Professor; DVM/MS in fish diseases, toxicology, microbiology; experience same as degree; 100 percent to aquaculture.

Bell, J.T.; Professor; DVM/Ph.D. in anatomy, histology; experience in fish diseases; 100 percent to aquaculture.

Bowser, P.R.; Assistant Professor; Ph.D. in fish diseases, virology; experience same as degree; 20 percent to aquaculture.

Busch, Robert L.; Assistant Fishery Biologist; Ph.D. in fisheries and allied aquacultures; experience in channel catfish production technology; 100 percent to aquaculture.

Dillard, James G.; Professor; Ph.D. in agricultural economics; experience in product economics, resource development, marketing; 40 percent to aquaculture.

Dooley, R. Larry; Associate Professor; Ph.D. in bioengineering; experience same as degree; 10 percent to aquaculture.

Hayes, John C.; Assistant Professor; Ph.D. in agricultural engineering; experience same as degree; 10 percent to aquaculture.

McCoy, C.P.; Associate Professor; DVM in toxicology, pathology; experience same as degree; 20 percent to aquaculture.

Miller, J. Scott; Research Associate; M.S. in agricultural economics; experience in marketing; 100 percent to aquaculture.

Poe, William E.; Associate Biochemist; M.S. in chemistry; experience in analytical chemistry, fish nutrition; 80 percent to aquaculture.

Reagan, Roland, E.; Associate Professor; Ph.D. in fish genetics; experience in fish breeding; 80 percent to aquaculture.

Robinette, H. Randall; Associate Professor; Ph.D. in aquaculture; experience in ration formulation and testing; 80 percent to aquaculture.

Tucker, Craig S.; Assistant Fishery Biologist; Ph.D. in channel catfish production, water quality; experience same as degree; 100 percent to aquaculture.

Waldrop, John E.; Professor; Ph.D. in agricultural economics; experience in product economy, resource development,

aquacultural economics; 40 percent to aquaculture.

Wilson, Robert L.; Professor; Ph.D. in biochemistry; experience in comparative biochemistry, fish nutrition; 40 percent to aquaculture.

Tuition: Resident undergraduate, \$470/term
Resident graduate, \$470/term
Non-resident undergraduate, \$907/term
Non-resident graduate, \$907/term
Out-of-state portion of tuition waived for supported graduate students

Admission Criteria: In order of importance: Undergraduate--test scores, grade point average; Graduate--grade point average, personal recommendations, test scores, State residency

Applications From: Director of Admissions; Mississippi State University; Mississippi State, MS 39762.

NEVADA

28. **Institution:** University of Nevada, Reno
Location: Reno, NV
Departments/Directors: 5305 Mill Street; Reno, NV 89502
School of Veterinary Medicine / Robert Taylor
Degrees Granted: No degree program in aquaculture at this time
Courses: Fisheries Management, 3 credit hours, annually
Fish and Wildlife Habitat, 3 credit hours, annually
These are taught in Renewable Natural Resources Division
- General Facilities:** 3 earthen ponds, .04 ha total surface area; 4 tanks; 3 plastic pools; 16 troughs
- Specialized Facilities:** Fish pathobiology
Cooperators: Nevada Department of Wildlife
Project/Objectives: Production of *Macrobrachium rosenbergii*--Commercial production in geothermal water.
- Baitfish in Western Nevada--Produce Lahontan Tui chub.
- Production of Sterile Grass Carp--For control of aquatic weeds.
- Services:** Disease diagnosis (whirling disease only)
- Funding Sources:** Federal Commercial Fisheries Funds
- Faculty/Staff:** Taylor, Robert; Professor; DVM with disease background; experience in trout diseases, freshwater prawn culture, and culture of various fish species; 50 percent time to aquaculture.

NEW YORK

29. **Institution:** State University of New York
Location: Stony Brook, LI, NY
Departments/Directors: State University of New York, Stony Brook, LI, NY 11794; (516) 246-7710
Marine Sciences Research Center / J.R. Schubel
Degrees Granted: MS, Ph.D.
Current Students: 5 MS, 7 Ph.D.
Students Since 1970: 6 MS, 3 Ph.D.

Courses: Theory and Practice in Management of Shellfish Resources, 3 credit hours annually
Marine Botany, 4 credit hours, annually

General Facilities: 60 concrete ponds/tanks, 63m² total surface area; 4 controlled-temperature raceways, 18m² total surface area; 12 shellfish cages/pens, 11.16m² total surface area; 2 shellfish rafts, 4.32m² total surface area

Specialized Facilities: Shellfish reproduction, shellfish nutrition, aquacultural water quality, hatchery technology, culture facilities for macroalgae culture

Cooperators: D.E.C., N.Y. State Sea Grant, Sea Grant, NMFS (Milford, CT), Towns (Brookhaven, East Hampton, Islip), Shinnecock Indian Aquaculture Project, commercial aquaculturists, Gas Research Institute

Project/Objectives: Demonstration of Commercial Clam and Oyster Culture: A Cooperative Study--Documentation and study of systems used by Shinnecock Indian Aquaculture Project.

Factors Influencing Growth and Survival of Hard Clams--Studies of predation and of feeding and growth of hard clams for application to culture situations.

Seaweed Culture/Marine Biomass--Development of seaweed farming in Northeast U.S.

Services: Information services (reprints, publications), demonstration scale research projects, e.g., raft culture of hard clams with East Hampton

Funding Sources: University grants and aids, in-kind match from towns, commercial companies

Student Support: Grants, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Breda, V.; Technician Specialist; M.S. in biology; experience in seaweed culture; 100 percent time to aquaculture.

Brinkhuis, B.H.; Assistant Research Professor; Ph.D. in marine biology; experience in seaweed culture/physiology/ecology; 80 percent time to aquaculture.

Kaufman, Z.; Technician Specialist; M.S. in marine environmental sciences; experience in nutrient chemistry; 100 percent time to aquaculture.

Kennedy, S.; Technician Specialist; B.S. in biology; experience in seaweed culture; 100 percent time to aquaculture.

Macher, B.A.; Assistant Research Professor; Ph.D. in biochemistry; experience in seaweed culture/photosynthetic bacteria; 100 percent time to aquaculture.

Malouf, Robert E.; Assistant Professor; Ph.D. in marine fisheries; experience in shellfish aquaculture, closed systems, heated effluents, hatchery technology; 50 percent time to aquaculture.

Mariani, E.; Technician Specialist; M.S. in biology; experience in seaweed culture; 100 percent time to aquaculture.

Tobin, S.; Technician Specialist; B.S. in marine sciences; experience in seaweed culture; 100 percent time to aquaculture.

Tuition: Resident graduate, \$1,700/year
Non-resident graduate, \$2,185/year
Tuition is waived for supported graduate students

Admission
Criteria: In order of importance: Grade point average, personal recommendations, test scores (ACT, SAT, GRE)

Applications
From: Program Director; Marine Sciences Research Center; State University of New York at Stony Brook; Stony Brook, LI, New York 11794

NORTH CAROLINA

30. Institution: East Carolina University
Location: Greenville, NC
Departments/Directors: East Carolina University; Greenville, NC 27834; (919) 757-6752
 Department of Biology, School of Home Economics (Nutrition Department) Institute of Coastal and Marine Resources / William Queen
Degrees Granted: MS (degree is in nutrition with thesis work in aquaculture or biology)
Current Students: 2 MS
Students Since 1970: 2 MS
General Facilities: 14 earthen ponds; 1 plastic pool; 72 nutrition tanks
Specialized Facilities: Fish reproduction, fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology
Cooperators: North Carolina State University, Texas Gulf
Project/Objectives: Development of Aquatic Nutrition Capability--Produce system for controlled nutrition experiments.
 Nutrition of the American eel (*Anguilla rostrata*)--Define the protein and lipid requirements of the American eel.
Funding Sources: University grants and aids, Sea Grant (NOAA)
Student Support: Grants, research assistantships
Faculty/Staff: Gallagher, Margie Lee; Assistant Professor; Ph.D. in nutrition; experience with crustaceans and fish; 50 percent time to aquaculture.
 O'Rear, Charles; Professor; Ph.D. in biology and physiology; experience with fish; 25 percent time to aquaculture.

Admission
Criteria: Grade point average, test scores (ACT, SAT, GRE)

Applications
From: Dean of Graduate School; East Carolina University; Greenville, NC 27834

31. Institution: North Carolina State University
Location: Raleigh, NC
Departments/Directors: North Carolina State University, Raleigh, NC 27650
 UNC Sea Grant College Program Zoology Department - School of Agriculture and Life Sciences / Ronald G. Hodson, Associate Director
Degrees Granted: MS, Ph.D.
Current Students: 1 MS, 2 Ph.D.
Students Since 1970: 4 MS, 2 Ph.D.
Courses: Ichthyology, 4 credit hours, annually
 Fishery Science, 4 credit hours, annually
 Comparative Physiology, 4 credit hours, annually

Growth and Reproduction of Fishes, 3 credit hours, twice annually
 Principles of Ecology, 4 credit hours, annually
 Aquaculture I and Lab, 4 credit hours, annually
 Limnology, 4 credit hours, annually
 Advanced Limnology, 3 credit hours, annually
 Advanced Parasitology, 3 credit hours, annually
 Genetics I and II, 8 credit hours, annually

**General
 Facilities:**

24 earthen ponds, 0.56 ha total surface area; 12 plastic pools, 38m² total surface area; 40 cages/pens; 4 runoff ponds, 8.0 ha total surface area

**Specialized
 Facilities:**

Fish nutrition, hatchery technology, aquarium rooms for various studies, several large ponds available for cage culture studies

Cooperators:

North Carolina Wildlife Resources Commission Division of Marine Fisheries, Dennis Wildlife Center in South Carolina (striped bass hatchery), McKinney Lake National Fish Hatchery, Leestown Hatchery in Virginia, Edenton National Fish Hatchery, NMFS (Kerby)

**Project/
 Objectives:**

Development of an Aquaculture Industry Capability in North Carolina Through Research and Demonstration--Determine pond-production dynamics of cultured American eels; initiate and maintain an aquaculture advisory service capability in North Carolina.

Nutritional Requirements of the American Eel--Determine optimum dietary components; formulate low-cost commercial rations for eels.

Services:

Aquaculture workshops, demonstration projects, information services (reprints, publications)

Funding Sources:

UNC Sea Grant College Program, Sport Fishing Institute, U.S. Fish and Wildlife Service

Student Support:

Teaching assistantships, research assistantships

Faculty/Staff:

DeMont, Dave J.; Assistant Professor; Ph.D.; experience in limnology, parasitology; 10 percent time to aquaculture.

Foster, John; Advisory Agent; B.S.; experience in fish culture; 100 percent time to aquaculture.

Gallagher, Margie; no rank given; Ph.D.; experience in fish nutrition; 50 percent time to aquaculture.

Hassler, William; Professor; Ph.D.; experience in aquaculture.

Hodson, Ronald G.; Assistant Professor; Ph.D.; experience in estuarine ecology; 25 percent time to aquaculture.

Huish, Melvin T.; Professor; Ph.D.; experience in fishery biology; 10 percent time to aquaculture.

Kerby, J. Howard; Associate Professor; Ph.D.; experience in aquaculture, fish hybridization.

Kincheloe, Roberta; Technician; B.S.; experience in fish culture; 100 percent time to aquaculture.

Miller, Grover C.; Professor; Ph.D.; experience in parasitology.

Miller, John M.; Associate Professor; Ph.D.; experience in aquatic ecology; 5 percent time to aquaculture.

Mozley, Samuel C.; Associate Professor; Ph.D.; experience in aquatic ecology; 5 percent time to aquaculture.

Tuition: Rouse, Randy; Technician; B.S.; experience in fish culture; 100 percent time to aquaculture.
 Admission: Out-of-state tuition is sometimes waived for graduate students.
 Criteria: Grade point average, test scores (ACT, SAT, GRE)
 Applications:
 From: UNC Sea Grant College Program; 105 1911 Building; North Carolina State University; Raleigh, North Carolina 27650

OKLAHOMA

32. Institution: Oklahoma State University (in Cooperation with Langston University)
 Location: Stillwater, Langston, OK
 Departments/
 Directors: LSW 433 Oklahoma State University; Stillwater, Oklahoma 74078; (405) 624-6342
 Oklahoma Cooperative Fishery Research Unit / O. Eugene Maughan
 Research Division, Langston University / Steve Latimer
 Degrees Granted: BS, MS, Ph.D.
 Current Students: 6 MS
 Students
 Since 1970: 3 MS
 Courses: Aquaculture, 3 credit hours, annually
 Ichthyology, 4 credit hours, annually
 Fisheries Management, 4 credit hours, annually
 Biology of Fishes, 4 credit hours, annually
 Advanced Fishery Science, 3 credit hours, annually
 General
 Facilities: 16 earthen ponds, 7 acres total surface area; 5 concrete ponds/tanks, 0.1 acre total surface area; 36 cages/pens, 21 acres total surface area
 Specialized
 Facilities: Aquacultural water quality
 Cooperators: Oklahoma Department of Wildlife Conservation, Oklahoma Water Quality Laboratory, U.S. Fish and Wildlife Service, Hickory Ridge Fisheries, Inc.
 Project/
 Objectives: Feasibility of Caged Fish Culture in North Central Oklahoma Farm Ponds--Determine the biological and economic feasibility of using small farm ponds for small-scale caged fish culture operations.
 Parasite Loads of Cultured Fish and Mechanisms of Control--Evaluate positive loads and means of control.
 Aquatic Weed Control in Oklahoma Aquaculture--Develop weed control technology for Oklahoma aquaculture.
 Services: Water quality analysis, information services (reprints, publications)
 Funding Sources: University grants and aids
 Student Support: Hourly work, teaching assistantships, research assistantships
 Faculty/Staff: Altman, Ralph; Associate Professor; Ph.D. in pond management; experience in extension fisheries; 30 percent time to aquaculture.
 Burks, Sterling; Associate Professor; Ph.D. in water quality; experience in toxicology-water quality; 15 percent time to aquaculture.
 Echelle, Tony; Associate Professor; Ph.D. in ichthyology; experience in ichthyology; 5 percent time to aquaculture.

Ewing, Margaret; Visiting Professor; Ph.D. in water quality, limnology; experience in water quality-fish disease; 50 percent time to aquaculture.

Gebhart, Glen E.; Langston University Staff Scientist; M.S. in fisheries biology; experience in cage fish culture; 100 percent time to aquaculture.

Maughan, O. Eugene; Associate Professor; Ph.D. in fish ecology; experience in cage culture; 25 percent time to aquaculture.

Miller, Rudy; Professor; Ph.D. in ichthyology; experience in fish behavior; 5 percent time to aquaculture.

Toetz, Dale; Professor; Ph.D. in fisheries management; experience in pond management; 5 percent time to aquaculture.

Wilhm, Jerry; Professor; Ph.D. in limnology; experience in limnology; 1 percent time to aquaculture.

Tuition:

Resident graduate, \$202.50/term

Non-resident graduate, \$616.50/term

Tuition is not waived for supported graduate students

Admission

Criteria:

Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications

From:

Graduate College; Room 202; Whitehurst Hall; Oklahoma State University; Stillwater, Oklahoma 74078

OREGON

33. Institution:

Oregon State University

Location:

Corvallis, OR

Departments/

Directors:

Oregon State University; Corvallis, OR 97331-3084; (503) 754-4441

Microbiology / Dr. J.L. Fryer

Degrees Granted:

MS, Ph.D.

Current Students:

2 MS, 8 Ph.D.

Students

Since 1970:

10 MS, 23 Ph.D.

Courses:

Diseases of Fish Lecture, 3 credit hours, annually

Diseases of Fish Laboratory, 2 credit hours, annually

General

Facilities:

Earthen ponds, concrete ponds/tanks, plastic pools, raceways

Specialized

Facilities:

Fish nutrition, fish pathobiology, fresh and salt water facilities for disease research

Cooperators:

Oregon Department of Fish and Wildlife, National Marine Fisheries Service, private industry, USDA, EPA, NOAA, NSF

Project/

Objectives:

Infectious Diseases of Salmonid Fishes.

Detection, Prevention and Control of Diseases in Fishes.

National Science Foundation US-Japan Cooperative

Grant--Detection, Prevention and Control of Diseases in Fishes.

National Science Foundation US-Taiwan Cooperative

Grant--Control of Infectious Diseases of Cultured Fish.

Detection of Piscine Erythrocytic Necrosis Virus in Oregon Fishes.

Bacterial Kidney Diseases of Salmonid Fish.

Development of a Subunit Vaccine to the Salmonid Virus, IHNV, by Molecular Cloning--Develop an effective subunit viral vaccine for Infectious Hematopoietic Necrosis Virus (IHNV). The gene sequence for the viral protein that induces a protective immune response in fish will be cloned by recombinant DNA technology. A practical and inexpensive method for producing large quantities of pure viral antigen will be developed.

Diagnosis of Fish Diseases--Provide diagnosis and treatment of infectious diseases of fish and inspection and certification of fish and fish eggs for interstate transport and import from and export to foreign countries.

Services: Disease diagnosis, water quality analysis
Funding Sources: State appropriations, USDA, EPA, NOAA, NMFS, NSF
Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships
Faculty/Staff: Fryer, J.L.; Professor; Ph.D. in microbiology (pathogenic, diseases of fish); experience in diseases of fish; 100 percent time to aquaculture.

Rohovec, J.S.; Assistant Professor; Ph.D. in microbiology; experience in diseases of fish; 100 percent time to aquaculture.

Winton, J.R.; Research Associate; Ph.D. in microbiology; experience in diseases of fish; 100 percent time to aquaculture.

Tuition: Resident undergraduate, \$347/term
Resident graduate, \$527/term
Non-resident undergraduate, \$1,233/term
Non-resident graduate, \$1,186/term
Tuition is waived for supported graduate students

Admission Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications From: Graduate Committee Chairman; Department of Microbiology; Oregon State University; Corvallis, OR 97331-3804.

34. Institution: Oregon State University

Location: Corvallis, OR

Departments/Directors: Corvallis, OR 97331-3804

Department of Fisheries and Wildlife, (503) 754-4531 / R. Tubb
Department of Food Science and Technology, (503) 754-3131 / P.E. Kifer

Department of Agricultural and Resource Economics (503) 754-2942 / A. Nielson

Degrees Granted: BS, MS, Ph.D., Master of Agriculture (Aquaculture)

Current Students: 95 BS, 3 (28) MS, 2 (16) Ph.D., 7 M. Agr. (aquaculture only, total fisheries in parentheses)

Students Since 1970: 28 MS, 8 Ph.D., 16 M.Agr. (aquaculture only)

Courses: Aquaculture, 3 credit hours, annually
Fish Culture, 3 credit hours, annually to twice a year
Molluscan Aquaculture, 4 credit hours, annually to twice a year
Diseases and Parasites of Marine Fish and Invertebrates, 5 credit hours, annually
Invertebrate Fisheries, 4 credit hours, annually
Aquacultural Engineering, 3 credit hours, annually

General Facilities: 8 earthen ponds, 1.2 ha total surface area; 6 concrete

ponds/tanks, 54m² total surface area; 66 plastic pools, 186m² total surface area; 12 troughs, 19.5m² total surface area.

Specialized Facilities: Fish processing technology, fish reproduction, fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology, hatchery technology

Cooperators: Oregon Department Fish and Wildlife, NMFS, USFWS, EPA, Oregon Coop. Fishery Research Unit, Consortium for International Fisheries and Aquacultural Development, Oregon Aquafoods Inc.

Project/ Objectives: Enhancement of Coastal Chum Salmon Resources.

Imprinting in Salmon: Odorant Recognition, Effects of Pollutants, and Artificial Cues in Freshwater and Saltwater.

Reproductive Physiology and Induced Maturation of Salmon Brood Stock.

The Use of Eyed Larvae as an Oyster Seed Source.

Molluscan Hatchery Technology.

Services: The Shellfish Advisory Program.
Feed analysis, pesticide analysis, occasional short courses and seminars, information services (reprints, publications), Marine Advisory Service

Funding Sources: Sea Grant

Student Support: Loans, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Bond, C.E.; Professor; Ph.D. in fish systematics, distribution, and aquaculture; experience in fish systematics, distribution, and aquaculture; 25 percent time to aquaculture.

Breese, W.P.; Professor; MS in marine aquaculture and marine water pollution biology; experience in marine aquaculture and marine water pollution biology; 90 percent time to aquaculture.

Horton, H.F.; Professor; Ph.D. in reproductive biology of fishes; experience in reproductive biology of fishes and marine extension; 10 percent time to aquaculture.

Lannan, J.E.; Associate Professor; Ph.D. in genetics of fish and shellfish in marine aquaculture; experience in genetics of fish and shellfish in marine aquaculture, 100 percent time to aquaculture.

Olson, R.E.; Associate Professor; Ph.D. in parasitology; experience in diseases of marine fishes and shellfish; 50 percent time to aquaculture.

Robinson, A.M.; Research Assistant; M.S. in zoology; experience in molluscan aquaculture; 100 percent time to aquaculture.

Schreck, C.B.; Associate Professor; Ph.D. in fisheries biology and physiology of fish; experience in fisheries biology and physiology of fish; 20 percent time to aquaculture.

Tubb, R.A.; Professor; Ph.D. in limnology and fishery biology; experience in limnology and fishery biology; 10 percent time to aquaculture.

Weber, L.J.; Professor; Ph.D. in comparative pharmacology and toxicology; experience in comparative pharmacology and toxicology; 10 percent time to aquaculture.

Tuition: Resident undergraduate, \$359/term
Resident graduate, \$546/term

Non-resident undergraduate \$1,251/term
 Non-resident graduate, \$940/term
 Tuition is waived for supported graduate students

Admission
Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations, state resident

Applications
From: Department of Fisheries and Wildlife; Oregon State University; Nash Hall 104; Corvallis, OR 97331

PENNSYLVANIA

35. Institution: Mansfield State College
Location: Mansfield, PA
Departments/Directors: Mansfield State College; Mansfield, PA 16933
 Biological Sciences / Vincent Smichowski
Degrees Granted: AS in fish culture, BA in biology with fish culture emphasis
Current Students: 10 BA, 23 AS
Students Since 1970: 19 AS
Courses: Flowing Water Fish Culture, 3 credit hours, annually
 Static Water Fish Culture, 3 credit hours, annually
 Ichthyology, 3 credit hours, annually
 Limnology, 3 credit hours, annually
 Fish Pathology, 2 credit hours, annually
 Nutrition of Fishes, 2 credit hours, annually
 Fish Management, 2 credit hours, annually
 Independent Study (aquaculture),
 Internship at Hatchery, 10 credit hours, annually
 Aquaculture Literature, 1 credit hour, annually
 Marine Biology, 3 credit hours, annually

General Facilities: 30 earthen ponds
Specialized Facilities: Fish reproduction, aquacultural water quality, hatchery technology, aquacultural engineering, fish culture
Cooperators: Pennsylvania Fish Commission, New York Department of Environmental Conservation, U.S. Fish and Wildlife Service, NFRDL, area farm pond owners, 10 U.S. private aquaculture companies

Project/Objectives: Farm Pond Management Program--Improve angling opportunities in private farm ponds.
 Intensive Culture of Tilapia--Develop criteria for the culture of *S. aurea* in flowing water.
 Closed Aquaculture System Development--Improve performance of fish in closed systems through water quality manipulation.
Services: Water quality analysis, educational workshops for pond owners and users
Funding Sources: State appropriations, university grants and aids
Faculty/Staff: Herman, Roger; Adjunct Professor; Ph.D. in aquatic ecology; experience in fish pathology; 10 percent time to aquaculture.
 Lemm, Carol; Adjunct Professor; B.S. in biology and chemistry; experience in fish nutrition; 10 percent time to aquaculture.
 Meyer, Kenneth; Associate Professor; Ph.D. in phytoplankton productivity; experience in water quality; 25 percent time to aquaculture.
 Smichowski, Vincent; D.Ed. in aquatic entomology; experience in

ichthyology and fish ecology; 60 percent time to aquaculture.

Soderberg, Richard; Assistant Professor; M.S. in fish culture; experience in intensive culture technology and farm pond management; 100 percent time to aquaculture.

Tuition: Resident undergraduate, \$625/semester
Non-resident undergraduate, \$1,040/semester

Admission Criteria: In order of importance: Science courses taken in high school or junior college, grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications From: Admissions Office; Alumni Hall; Mansfield State College; Mansfield, PA 16933

PUERTO RICO

- 36. Institution:** University of Puerto Rico
Location: Mayaguez, PR
Departments/Directors: University of Puerto Rico; Mayaguez, PR 00708; (809) 832-4040
Marine Sciences / Dr. Manuel Hernandez-Avila
Animal Industry / Prof. Francisco Suarez
MS, Ph.D.
Degrees Granted: 6 MS
Current Students: 12 MS
Students Since 1970:
Courses: Fisheries Biology, 3 credit hours, annually
Aquaculture, 4 credit hours, annually
Advanced Fisheries Biology, 3 credit hours, annually
Ichthyology I, 3 credit hours, annually
Ichthyology II, 3 credit hours, annually
Graduate Seminar, 1 credit hour, twice annually
Marine Biometry, 3 credit hours, annually
Hatchery Management, 3 credit hours, annually
Fish Breeding and Genetics, 3 credit hours, annually
Limnology, 2 credit hours, annually
Aquatic Animal Health, 3 credit hours, annually
Fish Nutrition, 3 credit hours, annually
Aquatic Pollution Biology, 3 credit hours, annually
Water Quality in Aquaculture, 3 credit hours, annually
Seafood Technology, 3 credit hours, annually
- General Facilities:** 28 earthen ponds, 4 ha total surface area; 17 concrete ponds/tanks, 105m² total surface area; 30 plastic pools, 300m² total surface area; 25 cages/pens, 25m³ total volume; 14 fiberglass tanks, 43m² total surface area; 60 aquaria, 40L volume each
- Specialized Facilities:** Fish processing technology, fish reproduction, fish nutrition, fish feed technology, aquacultural water quality, hatchery technology, limnology
- Cooperators:** State, Federal
Services: Feed analysis, water quality analysis
Funding Sources: State appropriations, Federal (Hatch), university grants and aids
Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships
Faculty/Staff: Alston, Dallas E.; Assistant Professor; Ph.D. in limnology; experience in pollution biology, invertebrate culture; 100 percent to aquaculture.
Appeldorn, Richard; Assistant Professor; Ph.D. in fisheries biology; experience same as degree; 20 percent to aquaculture.

Hensley, Dannie; Assistant Professor; Ph.D. in ichthyology; experience same as degree; 10 percent to aquaculture.

Kubaryk, John M.; Assistant Professor; Ph.D. in fish nutrition; experience in sea food technology, fish nutrition, water quality; 100 percent to aquaculture.

McGinty, Andrew S.; Assistant Professor; Ph.D. in breeding and genetics of fishes; experience in culture systems and parasitology of fishes; 100 percent to aquaculture.

Williams, Lucy B.; Instructor; M.S. in aquatic animal health; experience same as degree; 100 percent to aquaculture.

Tuition:
Resident undergraduate, \$600/term
Resident graduate, \$1,145/term
Non-resident undergraduate, \$1,100/term
Non-resident graduate, \$1,500/term

Admission
Criteria: In order of importance: grade point average, personal recommendations, test scores (ACT, SAT, GRE), letter of intent

Applications
From: Dr. Reinaldo Caban; Director; Graduate Studies Office;
University of Puerto Rico; Mayaguez, Puerto Rico 00708

RHODE ISLAND

37. Institution: University of Rhode Island
Location: Kingston, RI
Departments/
Directors: University of Rhode Island; Kingston, RI 02881; (401) 792-2114
Department of Aquaculture Science and Pharmacy / Dr. Thomas L. Meade
Department of Resource Economics / Dr. T.F. Weaver
Department of Food Science and Nutrition / Dr. A.G. Rand

Degrees Granted: BS, MS, Ph.D.
Current Students: 2 BS, 29 MS, 9 Ph.D.
Students
Since 1970: 1 BS, 34 MS, 3 Ph.D.
Courses: Introduction to Aquaculture, 3 credit hours, annually
Introduction to Pathology, 3 credit hours, annually
Genetics of Fish, 2 credit hours, annually
Salmonid Aquaculture, 3 credit hours, annually
Industrial Fish Technology, 3 credit hours, alternate years
Pathology Rotation, 3 credit hours, annually
Advanced Aquaculture Systems, 3 credit hours, alternate years
Fish Nutrition, 3 credit hours, alternate years
Aquaculture Economics, 4 credit hours, alternate years

General
Facilities: 42 plastic pools; 4 silos
Specialized
Facilities: Fish reproduction, fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology, hatchery technology, aquacultural engineering

Cooperators: USDA (HATCH), U.S. Fish and Wildlife Service, Sea Grant, EPA, USAID Title XII

Project/
Objectives: Standard Nutrition in Aquatic-EPA Toxicology--Develop standard Artemia source for EPA research.

Biochemical Characteristics of Artemia--Develop standards for Artemia feeding.

Quality of Artemia Cultured in Southeast Asia--Train SEAFDEC

chemists to analyze Artemia.

Identification of Suboptimal Environmental Parameters Affecting Aquaculture--Mount a multidisciplinary approach to the elucidation of suboptimal environmental parameters responsible for inefficient growth, poor reproduction and increased disease incidence in aquaculture production system. Identification and clarification of these critical parameters will be followed by appropriate investigation of remedial measures.

Detection Transmission and Pathogenesis of Disease Organisms in Aquaculture Species--Improve methods to detect and diagnose pathogenic microorganisms and parasites of fishes and selected native species of mollusca, and establish base line data on the role of feral fishes in the spread of diseases to cultured salmonids and other fishes.

Investigation of "In Situ" Solids Digestion for Salmonid Production--Reduce the cost of water treatment in salmonid production by "in situ" solids digestion; characterize the microbial processes involved in an intermediate salinity (10 o/oo) environment; evaluate selective nutrient enrichment of fresh water to achieve "in situ" solids digestion; insure that fish health is not impaired when "in situ" solids digestion is carried out in the culture system.

Breeding Experiments with Salmonids--Address the problems in profitable rearing of cultured salmon of reduced growth rate at the onset of sexual maturation and subsequent death of a proportion of the stock during spawning.

Services: Disease diagnosis, water quality analysis
Funding Sources: Federal (Hatch), Sea Grant
Student Support: Loans, grants, hourly work, research assistantships
Faculty/Staff: Chang, P.W.; Professor; DVM and Ph.D. in virology; 30 percent time to aquaculture.

Durfee, W.K; Professor; Ph.D. in poultry physiology; experience in shellfish culture; 100 percent time to aquaculture.

Gates, J.M.; Professor; Ph.D. in agricultural economics; experience in fisheries and aquacultural economics; 0 to 50 percent time to aquaculture.

Meade, T.L.; Professor; Ph.D. in nutrition and biochemistry; experience in fish physiology, nutrition and systems engineering; 85 percent time to aquaculture.

Smith, L.T.; Professor; Ph.D. in genetics and statistics; 100 percent time to aquaculture.

Wolke, R.E., Professor; DVM and Ph.D. in fish pathology; 100 percent time to aquaculture.

Tuition: Resident undergraduate, \$514/semester
Resident graduate, \$534/semester
Non-resident undergraduate, \$1,776.00/semester
Non-resident graduate, \$1,195/semester
Tuition is waived for supported graduate students

Admission Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations, experience and personal qualifications

Applications From: Dean of Admissions; University of Rhode Island; Kingston, RI 02881

SOUTH CAROLINA

- 38. Institution:** Clemson University
Location: Clemson, SC
Departments/ Directors: Clemson University; Clemson, SC 29631; (803) 656-3311
 Entomology, Fisheries, and Wildlife / Dr. S.B. Hays
 Agricultural Engineering / Dr. B.K. Webb
Degrees Granted: MS, Ph.D. (Animal Physiology)
Current Students: 12 MS
Students Since 1970: 29 MS
Courses: Aquaculture, 3 credit hours, alternate years
 Fishery Biology, 3 credit hours, annually
 Aquatic Productivity, 3 credit hours, annually
 Biology of Marine Organisms, 3 credit hours, alternate years
 Ichthyology, 3 credit hours, annually
 Practicum, 1-4 credit hours, irregular
 Special Topics in Fishery Biology, 1-4 credit hours, irregular
- General Facilities:** 10 earthen ponds, 1 ac. total surface area; 40 plastic pools, 0.1 ac. total surface area; 40 tanks
- Specialized Facilities:** Fish nutrition, aquacultural engineering
- Cooperators:** Marine Resources Research Institute, South Carolina Wildlife and Marine Resources Department, Walhalla National Trout Hatchery, Orangeburg Federal Fish Hatchery, NOAA NMFS--Charleston, SC, Santee Cooper Aquacultural Facility, Santee Cooper Public Service Authority, Sea Grant
- Project/ Objectives:**
- Carbohydrate Digestibility by *Tilapia aurea*--Determine the digestibility coefficients of a variety of purified carbohydrates by tilapia.
- Parasites of Cultured American Eel (*Anguilla rostrata*)--Survey the occurrence of microbial disease and parasite infestations in eels; identify viral and bacterial pathogens and animal parasites of cultured American eel.
- Equipment for Mechanization of Production of Oysters and Other Shellfish--Evaluate mechanical equipment for harvesting and transplanting oysters. Conduct environmental impact study of a mechanical harvesting system. Investigate the feasibility of mechanically handling and harvesting hard clams in a tray/raft culture system. Develop equipment for deheading fresh market shrimp.
- Freshwater Food Animals--Develop and improve production and management systems for freshwater animals cultured for food. Nutrition, water quality, diseases and culture systems. Evaluate the economics of production processing and marketing of freshwater food animals.
- Management and Culture of Molluscan Species--Determine compensatory growth in stunted clams; describe relative and absolute growth of clams cultured in South Carolina; determine the effectiveness of using aggregate complexes to increase recruitment and survival of clams; determine the feasibility of a proposed mariculture strategy for clams in South Carolina and determine the extent and dynamics of natural populations of molluscan species in South Carolina.
- Warmwater Aquaculture--Develop and advance methods for the

economic rearing, processing and marketing of warmwater aquatic animals with economic potential.

Services: Feed analysis, water quality analysis, information services (reprints, publications)

Funding Sources: State appropriations, Federal (Hatch)

Student Support: Research assistantships

Faculty/Staff: Collier, John A.; Assistant Professor; Ph.D. in Agricultural Engineering; experience in aquacultural engineering; 80 percent time to aquaculture.

Crane, John; staff; M.S. in fish health and fish culture; experience same as degree; 75 percent time to aquaculture.

Eversole, Arnold G.; Associate Professor; Ph.D. in shellfish biology; experience in shellfish culture, shellfish nutrition, fish health; 30 percent

Foltz, Jeffrey; Assistant Professor; Ph.D. in fish nutrition and fish culture; experience same as degree; 30 percent of time to aquaculture.

Tuition: Resident undergraduate, \$1,394/term
Resident graduate, \$675/term
Non-resident undergraduate, \$675/term
Non-resident graduate, \$675/term
Tuition is reduced 50 percent for supported graduate students

Admission Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations, applicant's research interests and career objectives.

Applications From: Graduate Admissions; Clemson University; Clemson, SC 29631

SOUTH DAKOTA

39. **Institution:** South Dakota State University

Location: Brookings, SD

Departments/Directors: South Dakota State University; Brookings, SD 57006
Wildlife and Fisheries Science / Dr. Charles G. Scalet

Degrees Granted: BS, MS

Current Students: 110 BS (wildlife and fisheries), 13 MS (fisheries only)

Students Since 1970: 200 BS, 50 MS

Courses: Ichthyology, 3 credit hours, annually
Principles of Fish Management, 4 credit hours, annually
Introduction to Wildlife and Fish Management, 2 credit hours, annually
Fisheries Science, 3 credit hours, alternate years
Aquatic Ecology, 3 credit hours, alternate years
Aquatic Plants, 3 credit hours, alternate years
Oceanography, 3 credit hours, annually
Aquatic Insects, 3 credit hours, alternate years

General Facilities: 9 earthen ponds, 1.4 ha total surface area; 6 raceways; numerous cages/pens; numerous tanks

Specialized Facilities: Fish reproduction, fish nutrition, hatchery technology

Cooperators: Game Fish and Parks, U.S. Fish and Wildlife Service

Project/Objectives: South Dakota Farm and Ranch Fisheries--Determine the feasibility of culturing annual crops of channel catfish and rainbow trout in eastern South Dakota dugouts and determine the forage species which produce the greatest growth rates and harvestable biomass of largemouth bass in South Dakota ponds

and determine the panfish species which, when stocked with largemouth bass, is least susceptible to overpopulation.

Services: Information services (reprints, publications)

Funding Sources: State appropriations, Federal (Hatch), U.S. Fish and Wildlife Service

Student Support: Research assistantships

Faculty/Staff: Applegate, Richard; Professor; Ph.D. in fisheries; experience in fisheries; 100 percent time to aquaculture.

Modele, Timothy C.; Assistant Professor; Ph.D. in fisheries; experience in fisheries; 80 percent time to aquaculture.

Scalet, Charles G.; Associate Professor and Department Head; Ph.D. in fisheries; experience in fisheries; 75 percent of time to aquaculture.

Tuition: Resident undergraduate, \$390/term
Resident graduate, \$294/term
Non-resident undergraduate, \$864/term
Non-resident graduate, \$554/term
Tuition is reduced by two thirds for supported graduate students

Admission Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications From: Dr. Charles G. Scalet; Wildlife and Fisheries Service; South Dakota State University; Brookings, SD 57006

TENNESSEE

40. Institution: Memphis State University

Location: Memphis, TN

Departments/Directors: Memphis State University; Memphis, TN 38152; (901) 454-2955
Biology / Dr. James F. Payne

Degrees Granted: MS, Ph.D. (Major in Biology, with concentration in Vertebrate Zoology)

Current Students: 6 MS, 4 Ph.D. (in Aquaculture area)

Students Since 1970: 10 MS, 3 Ph.D.

Courses: Aquaculture, 3 credit hours, alternate years
Limnology, 4 credit hours, alternate years
Ichthyology, 4 credit hours, alternate years
Comparative Animal Physiology, 5 credit hours, alternate years
Endocrinology, 3 credit hours, annually
Immunology and Advanced Immunology, 4 credit hours, annually
Population Genetics, 4 credit hours, alternate years

General Facilities: 5 earthen ponds, 4 ha total surface area; 40 concrete ponds/tanks; 2 plastic pools

Specialized Facilities: Fish reproduction, aquacultural water quality

Cooperators: Tennessee Wildlife Resources Agency, supports research activities; U.S. Fish and Wildlife Service (Marion, Alabama, and Stuttgart and San Marcos, TX)

Project/Objectives: Hormonal Control of Reproduction in Channel Catfish--Understand the environmental influences and the endocrine responses that result in gonadal maturation and seasonal spawning in channel catfish.

Stress Response Characteristics in Largemouth Bass.

Immune Response Capability of Channel Catfish.

Services: Genetic Analysis of Carp Hybrids.
Disease diagnosis, water quality analysis, information services (reprints, publications)

Funding Sources: State appropriations, Federal (non-Hatch), university grants and aids

Student Support: Grants, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Beck, Melvin L.; Associate Professor; Ph.D. in genetics; experience same as degree; 10 percent to aquaculture.

Biggers, Charles; Professor; Ph.D. in genetics; experience same as degree; 10 percent to aquaculture.

Davis, Kenneth B.; Professor; Ph.D. in physiology; experience same as degree; 35 percent to aquaculture.

Ourth, Donald; Associate Professor; Ph.D. in immunology (mammalian); experience in fish immunology; 25 percent to aquaculture.

Simco, Bill; Professor; Ph.D. in zoology (aquaculture); experience in aquaculture; 35 percent to aquaculture.

Wilhelm, Walter; Associate Professor; Ph.D. in parasitology; experience in parasitology and protozoology; 5 percent to aquaculture.

Tuition: Resident undergraduate, \$416/term
Resident graduate, \$506/term
Non-resident undergraduate, \$1,295/term
Non-resident graduate, \$1,385/term
Out-of-state fees waived

Admission Criteria: In order of importance: Grade point average, test scores (ACT, SAT, GRE), personal recommendations.

Applications From: Department of Biology; Memphis State University; Memphis, TN 38152

41. Institution: Tennessee Technological University

Location: Cookeville, TN

Departments/Directors: Tennessee Technological University; Box 5063; Cookeville, TN 38501; (615) 528-3134
Biology / Dr. William K. Willard

Degrees Granted: BS, MS

Current Students: 163 BS, 40 MS

Students Since 1970: 395 BS, 168 MS

Courses: Invertebrate Zoology, 8 credit hours, annually
Ichthyology, 4 credit hours, annually
Fish Management, 4 credit hours, annually
Fish Culture, 4 credit hours, annually
Limnology, 4 credit hours, annually
Pond Management, 4 credit hours, annually
Phycology, 4 credit hours, annually
Aquatic Microbiology, 5 credit hours, annually
Freshwater Invertebrates, 5 credit hours, annually
Biology of the Chironomids, 5 credit hours, annually
Marine Microbiology, 7.5 credit hours, annually
Parasites of Marine Animals, 9 credit hours, annually
Marine Invertebrate Zoology, 6 credit hours, annually
Marine Vertebrate Zoology and Ichthyology, 9 credit hours, annually

Marine Botany, 6 credit hours, annually

General Facilities: Tanks, 22.5m² total surface area

Specialized Facilities: Fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology

Cooperators: Tennessee Wildlife Resources Agency, U.S. Fish and Wildlife Service

Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Bulow, Frank J; Professor; Ph.D. in zoology; experience in ichthyology; 100 percent time to aquaculture.

Coburn, Corbett B.; Associate Professor; Ph.D. in zoology; experience in physiology; 50 percent time to aquaculture.

Estes, R. Don; Associate Professor; Ph.D. in wildlife management; experience in fishery biology; 100 percent time to aquaculture.

Harris, John W.; Professor; Ph.D. in zoology; experience in genetics; 25 percent time to aquaculture.

Jordon, O. Ray; Assistant Professor; M.S. in zoology; experience in herpetology; 25 percent time to aquaculture.

Martin, Robert E.; Professor; Ph.D. in zoology; experience in ecology; 75 percent time to aquaculture.

Morgan, Eric L.; Associate Professor; Ph.D. in zoology; experience in ecology; 100 percent time to aquaculture.

Ridley, Bromfield L.; Professor; Ph.D. in zoology; experience in wildlife management; 50 percent time to aquaculture.

Tuition: Resident undergraduate, \$235/term
Resident graduate, \$292/term
Non-resident undergraduate, \$510/term
Non-resident graduate, \$510/term
Tuition is waived for supported graduate students

Admission Criteria: Grade point average

Applications From: Department of Biology; Tennessee Tech University; Cookeville, TN 38501

42. Institution: The University of Tennessee

Location: Knoxville, TN

Departments/Directors: P.O. Box 1071; Knoxville, TN 37901; (615) 974-7164
Forestry, Wildlife and Fisheries / Dr. Gary Schneider

Degrees Granted: MS

Current Students: 2 MS

Students Since 1970: 5 MS

Courses: Fish Physiology, 3 credit hours, annually
Advanced Topics in Fisheries--wide variety of topics including aquaculture, 2-3 credit hours, alternate years

General Facilities: 12 fiberglass and galvanized tanks, 40m² total surface area

Specialized Facilities: Fish nutrition, fish feed technology, aquacultural water quality, aquacultural engineering

Cooperators: Tennessee Wildlife Resources Agency, S-83 (1971-81), S-168 (1981-86), U.S.D.A. Special Research Grant in Aquaculture

**Project/
Objectives:**

Digestibility of High-energy and High-protein Feedstuffs for Channel Catfish--Determine digestible energy (DE) and digestible crude protein (DCP) for important ration components of catfish diets.

Tank Culture of Channel Catfish and Tilapia in Flow-through System--Assess the effects of different densities of tilapia in combination with channel catfish.

Utilization of Waste Heat in Aquaculture System--Assess the potential of heating water used for fish culture by capturing waste heat energy generated by composting.

Applied Physiology of Economically Important Fishes--Use plasma cortisol and glucose concentrations to measure acute stress during management and culture procedures and develop ways of reducing stress, develop enzyme assays as indicators of chronic stress caused by pollution or other adverse environmental conditions.

Warmwater Aquaculture--Develop and advance methods required for the economic rearing, processing, and marketing of warmwater aquatic animals with economic potential.

Services:

Disease diagnosis (parasites only), water quality analysis, fish disease short course in conjunction with U.S. Fish and Wildlife Service, Fish Health Lab

Funding Sources:

Federal (Hatch), USDA

Student Support:

Grants, hourly work, research assistantships

Faculty/Staff:

Strange, Richard J.; Assistant Professor; Ph.D. in fish physiology; experience in fisheries management and fish nutrition; 30 percent of time to aquaculture.

Wilson, J. Larry, Associate Professor; Ph.D. in fisheries management; experience in management, population dynamics, aquaculture; 35 percent of time to aquaculture.

Tuition:

Resident graduate, \$200/term

Non-resident graduate, \$600/term

Tuition waived for supported graduate students

Admission

Criteria:

Grade point average, test scores (ACT, SAT, GRE), personal recommendations

Applications

From:

Department of Forestry, Wildlife, and Fisheries; University of Tennessee; P.O. Box 1071; Knoxville, TN 37901

TEXAS

43. Institution:

Texas A and M University

Location:

College Station, TX

Departments/

Directors:

Texas A and M University; College Station, TX 77843; (713) 845-5777

Wildlife and Fisheries Sciences / Wallace Klussmann

Degrees Granted:

BS, MS, Ph.D., Master of Agriculture

Current Students:

20 BS, 17 MS, 23 Ph.D., 3 Master of Agriculture

Courses:

Aquaculture, 3 credit hours, twice annually

Biology of Fishes, 3 credit hours, annually

Aquaculture Lab, 1 credit hour, annually

Fisheries Survey, 4 credit hours, annually

Mariculture, 4 credit hours, annually

Fisheries Population Dynamics, 3 credit hours, annually

Fish Nutrition, 3 credit hours, annually

Fish Diseases, 3 credit hours, annually

Estuarine Ecology, 4 credit hours, annually
 Shore and Estuarine Fishes, 3 credit hours, annually
 Principles of Fisheries Economics, 3 credit hours, annually
 Biological Limnology, 3 credit hours, annually
 Principles of Fisheries Management, 3 credit hours, annually
 Ichthyology, 3 credit hours, annually
 Systematic Ichthyology, 3 credit hours, annually
 Field Ichthyology, 1-6 credit hours, annually
 Invertebrate Fisheries, 3 credit hours, annually
 Seafood Technology, 3 credit hours, annually
 Seminar, 1 credit hour, annually

**General
 Facilities:**

27 earthen ponds, 1.8 ha total surface area; 6 concrete ponds/tanks, 12m² total surface area; 12 plastic pools, 50m² total surface area; 180 raceways (circular), 10m² total surface area; 25 cages/pens, 25m² total surface area; 100 aquaria, 5-6m² total surface area

**Specialized
 Facilities:**

Fish processing technology, fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology, hatchery technology

Cooperators:

Parks and Wildlife, Texas Department of Agriculture, SRCR Project S-168, USDA, USAID, BARD, private industry

**Project/
 Objectives:**

Cottonseed Meal Study--Use of cottonseed products in diets for catfish and Tilapia.

Development of Fry Catfish Feeds--Phased feed development.

Fatty Acid Requirements of Channel Catfish--Identify the family or families of polyunsaturated fatty acids which are required for optimum growth and food conversion of channel catfish, *Ictalurus punctatus*; determine the symptoms and pathology occurring in catfish fed essential acid deficient diets; evaluate the ability of catfish to modify fatty acids through chain elongation and desaturation.

Shrimp Maturation, Reproduction, Development, Nutrition, Intensive-Extensive Culture and Mariculture--Obtain basic and applied knowledge required for development of penaeid shrimp mariculture as a successful industry. This includes reproduction in captivity, development of satisfactory dried prepared feeds, and improvement of shrimp production from intensive and extensive culture.

Warmwater Aquaculture--Develop and advance methods required for the economic rearing, processing, and marketing of warmwater aquatic animals with economic potential.

Fish Populations and Production in Small Impoundments--Evaluate predator species, and their ecological interactions, for small impoundments; determine optimal forage fish for use as prey for piscivorous species in different regions of the state; evaluate harvest regimes (regulations) which best achieve fishing objectives; make recommendations for approaches to sport fishery management of small impoundments which will be consistent with the best available information on environmental conditions, land and water use practices, and public needs.

Culture of Aquatic Organisms and Evaluation of Environmental Conditions at Steam Electric Plants--Determine which species are best suited for culture at specific sites and if they can be cultured commercially. Compare polyculture with monoculture and culture of mixed-age organisms with those of uniform age. Assess the potential of various culture systems for use at power plants. Investigate problems such as gas supersaturation

in discharge water. Determine occurrence, abundance, and distribution of wild species in areas influenced by a power plant and apply this information to culture.

Services: Disease diagnosis, feed analysis, pesticide analysis, water quality analysis, in-service training for persons from outside our institution, information services (reprints, publications)

Funding Sources: State appropriations, Federal (Hatch), university grants and aids, private

Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Aldrich, David V.; Professor; Ph.D. in estuarine ecology and mariculture.

Chamberlain, George; Mariculture Specialist; M.S. in mariculture.

Chittenden, Mark E., Jr.; Associate Professor; Ph.D. in marine fisheries and population dynamics.

Clark, William J.; Associate Professor; Ph.D. in limnology and aquatic ecology.

Cuenco, Michael; Instructor; M.S. in aquaculture.

Davis, James T.; Fisheries Specialist; Ph.D. in fisheries.

Griffin, Wade; Associate Professor; Ph.D. in agricultural economics.

Higginbotham, Billy; Fisheries Specialist; M.S. in fisheries.

Johnson, S.K.; Fish Disease Specialist; Ph.D. in fish diseases.

Klussman, Wallace G.; Professor; Ph.D. in fisheries and aquaculture.

Lawrence, Addison; Professor; Ph.D. in mariculture.

Linton, Tom L.; Associate Professor; Ph.D. in biology and management of marine fish.

McEachran, John D.; Associate Professor; Ph.D. in marine fisheries.

McGeachin, Robert; Technician; Ph.D. in aquaculture.

Neill, William H.; Associate Professor; Ph.D. in behavioral and physiological ecology of fish.

Noble, Richard L.; Professor; Ph.D. in fish population ecology.

Robinson, Edwin H.; Assistant Professor; Ph.D. in fish nutrition.

Steinbach, Don W.; Fisheries Specialist; Ph.D. in fisheries.

Stickney, Robert R.; Associate Professor; Ph.D. in aquaculture and estuarine ecology.

Strawn, R. Kirk; Professor; Ph.D. in fisheries biology and physiology.

Tuition: Resident undergraduate, \$175-225/term
 Resident graduate, \$175-225/term
 Non-resident undergraduate, \$760/term
 Non-resident graduate, \$175-225/term
 Non-resident fee is waived for supported graduate students

Admission Criteria: In order of importance: Test scores (ACT, SAT, GRE), personal recommendations, grade point average, personal contact during application period, state residency

Applications From: Dr. Wallace Klussman; Department of Wildlife and Fisheries Sciences; Texas A and M University; College Station, TX 77843

44. Institution: **Texas A and M University**
Location: College Station, TX
Departments/Directors: College of Veterinary Medicine; Texas A and M University; College Station, TX 77843; (713) 845-5941
Veterinary Microbiology and Parasitology / D.H. Lewis
Degrees Granted: MS, Ph.D.
Current Students: 42 MS, 5 Ph.D.
Students Since 1970: 80-90 MS, 10-12 Ph.D.
Courses: Aquatic Animal Microbiology, 3 credit hours, annually
Diseases of Marine Invertebrates, 4 credit hours, alternate years
Diseases of Fish, 4 credit hours, annually
Introduction to Diseases of Food Fish, 1 credit hour, annually
Interdisciplinary Disease Studies, 4 credit hours, twice annually
Zoo and Aquatic Animal Medicine, 1 credit hour, twice annually

General Facilities: 10 earthen ponds, 1 acre total surface area; 8 plastic pools, 1 acre total surface area

Specialized Facilities: Fish nutrition, aquacultural water quality, fish pathobiology

Cooperators: Texas Parks and Wildlife, Texas Agricultural Experiment Station, USDA Competitive Grants, NOAA-Sea Grant, BARD

Project/Objectives: Microbial Diseases of Warmwater Pond Fish (BARD).
Microbial Diseases and Immune Response of Catfish.
Disease Management in Crayfish Aquaculture.
Microbial Diseases of Shrimp.
Disease Management in Catfish Aquaculture--Identify early warning indicators of environmental stress. Identify factors associated with host susceptibility and pathology of bacterial hemorrhagic septicemia in cultured catfish. Develop and evaluate countermeasures for reducing the incidence of bacterial hemorrhagic septicemia in cultured catfish.
Early Warning Indicators of Environmental Stress in Crawfish--Correlate the shell calcium content and deposition of water hardness, ascertain if the presence or the rate of incidence of pathologic conditions can be correlated with the environmental stresses on colonization of chitinoelastic pathogens, assess the changes of hemolymph cells associated with the environmental stresses.

Services: Disease diagnosis, feed analysis, pesticide analysis, water quality analysis, information services (reprints, publications)

Funding Sources: Federal (Hatch), various Federal grants

Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Brown, C.D.; Professor; DVM; experience in diagnostics; 5 percent time to aquaculture.

Haensly, W.E.; Professor; Ph.D. in microanatomy; experience in microanatomy and pathology; 10 percent time to aquaculture.

Lewis, D.H.; Professor; Ph.D. in microbiology; experience in microbiology and pathology; 30 percent time to aquaculture.

McConnell, S.; Professor; Ph.D. in virology; experience same as degree; 10 percent time to aquaculture.

Sis, R.F.; Professor; Ph.D. in histology and microanatomy; experience in histology; 10 percent time to aquaculture.

Tuition: Resident undergraduate, \$60/term

Resident graduate, \$60/term

Tuition is not waived for supported graduate students

Admission

Criteria:

In order of importance: Grade point average, personal recommendations, test scores, state residency

Applications

From:

Head, Department of Veterinary Microbiology and Parasitology;
College of Veterinary Medicine; Texas A and M University;
College Station, TX 77843

45. Institution: Texas A and M University

Location:

College Station, TX

Departments/

Directors:

Texas A and M University; 442 Kleberg Center; College Station, TX 77847; (713) 845-3246

Seafood Technology Section, Department of Animal Science / Dr. Zerle Carpenter

Degrees Granted:

BS, MS, Ph.D. (Food Science and Technology)

Current Students:

5 MS, 4 Ph.D.

Students

Since 1970:

14 MS, 6 Ph.D.

Courses:

Seafood Processing and Preservation, 4 credit hours, annually

Specialized

Facilities:

Fish processing technology

Cooperators:

Texas Parks and Wildlife, Texas Shrimp Association, Gulf and South Atlantic Fisheries Development Foundation, NMFS, Weyerhaeuser, FMC, Red Lobster

Services:

Seafood quality control workshop, information services (reprints, publications)

Funding Sources:

State appropriations, university grants and aids, private

Student Support:

Grants, hourly work, research assistantships

Faculty/Staff:

Finne, Gunnar; Associate Professor; Ph.D. in biochemistry, fish technology; experience in seafood technology (biochemistry); 10 percent time to aquaculture.

Nickelson, Ranzell; Extension Specialist; Ph.D. in microbiology, food science, and teaching; experience in seafood technology (quality and safety); 10 percent time to aquaculture.

Admission

Criteria:

In order of importance: Personal recommendations, grade point average, test scores

Applications

From:

Seafood Technology; Room 442; Kleberg Center; Texas A and M University; College Station, TX 77843

VIRGINIA

- 46. Institution:** Virginia Institute of Marine Science, College of William and Mary
- Location:** Gloucester Point, VA
- Departments/ Directors:** VIMS; Gloucester Point; VA 23062; (804) 642-2111
Microbiology, Plankton, and Benthic Ecology
Marine Advisory Services / Dr. W.D. DuPaul
Eastern Shore Division / Mr. M. Castagna
- Degrees Granted:** MA, Ph.D., continuing education credits
- Current Students:** 86 MA (1 in aquaculture), 54 Ph.D. (2 in aquaculture), 25 Certificate
- Students Since 1970:** 108 MA, 47 Ph.D., 114 Certificate
- Courses:** Ichthyology, 3 or 5 credit hours, as required
Diseases of Marine Organisms, 4 credit hours, alternate years
Problems in Marine Science, 1-4 credit hours, three time a year
Marine Phytoplankton, 3 credit hours, alternate years
Clam Culture, continuing education credits, twice a year
- General Facilities:** 10 flumes, 27m² total surface area; 77 fiberglass troughs, 135m² total surface area; assigned oyster leases, 50.8 ha total area
- Specialized Facilities:** Fish pathobiology, hatchery technology, cost accounting
- Cooperators:** NOAA Sea Grant, NOAA-NMFS
- Project/ Objectives:** Mercenaria mercenaria Culture--Cost-effective method of commercially growing clams.
- Mariculture of Shellfish Disease Resistance--Selective culture of oyster strains potentially resistant to Perkinsis marina ("Dermo"); experimental evaluation of strains for resistance.
- Artificial Food for Oyster Larvae--Define carbohydrate, lipid, and protein composition of algal foods and oyster larvae; test acceptability/digestibility of microcapsules.
- Utilization of Brewery Wastes for Oyster Mariculture--Investigate four approaches to use of brewery wastes as food for oysters.
- Services:** In-service training in hatchery and grow-out techniques, information services (reprints; publications)
- Funding Sources:** State appropriations, NOAA Sea Grant
- Student Support:** Loans, grants, hourly work, teaching assistantships, research assistantships, national fellowships
- Faculty/Staff:** Burton, William; no rank given; B.S. in biology; experience in finfish culture; 100 percent time to aquaculture.
- Casey, Beverly, A.; no rank given; B.A. in biology; experience in unicellular algal culture; 100 percent time to aquaculture.
- Castagna, Mike; Associate Professor; M.S. in biology; experience in clam and oyster culture; 100 percent time to aquaculture.
- Chu, Fu Lin; no rank given; M.A. in marine biology; experience in bivalve larval culture and biochemistry; 100 percent time to aquaculture.
- Comyns, Bruce; no rank given; B.S. in biology; experience in mollusk and finfish culture; 100 percent time to aquaculture.
- Hepworth, Daniel; no rank given; B.A. in biology; experience in bivalve larval culture; 100 percent time to aquaculture.
- Oesterling, Mike; no rank given; M.S. in zoology; experience in commercial fish and soft blue crab production; 50 percent time to aquaculture.

Rideout, Carol B.; MTS in biology; experience in aquaculture information; 100 percent time to aquaculture.

Roberts, Morris H. Jr.; Associate Professor; Ph.D. in marine biology; experience in crustacean and bivalve culture and aquatic toxicology; 50 percent time to aquaculture.

Tuition is not waived for supported graduate students

Tuition:
Admission
Criteria:

In order of importance: Personal recommendations, grade point average, state residency, breadth of study in math, physics, and chemistry, and test scores (ACT, SAT, GRE)

Applications

From:

Dr. John M. Ziegler; Associate Dean; School of Marine Science; Virginia Institute of Marine Science; College of William and Mary, Gloucester Point, VA 23062

WASHINGTON

47. Institution: Grays Harbor College

Location: Aberdeen, WA

Departments/

Directors:

Grays Harbor College; College Heights; Aberdeen, WA 98520

Life Science / Louis Messmer

Vocational Education Division / Dr. Jon Krug (Associate Dean)

Program Head, Don Samuelson

Associate of Science Fisheries and Wildlife, General Studies

40 A.S.

Degrees Granted:

Current Students:

Students

Since 1970:

120 A.S.

Courses:

Introduction to Fisheries, 2 credit hours, annually

Fisheries Biology, 5 credit hours, annually

Chemical Field and Laboratory Methods, 6 credit hours, annually

Biological Field and Laboratory Methods, 6 credit hours, annually

Aquaculture, 3 credit hours, annually

General

Facilities:

1 asphalt pond/tank, 240 ft² total surface area; raceways, 240 ft² total surface area; 2 cages/pens floating, 400 ft² total surface area; 20 fiberglass tanks and troughs, 250 ft² total surface area.

Specialized

Facilities:

Aquacultural water quality, hatchery technology, egg taking, brood stock holding, and pen rearing facilities

Cooperators:

Washington Departments of Fisheries, Game, Ecology, and Natural Resources, Pacific Fisheries Management Council, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, EPA, Sea Grant, NMFS, local private hatcheries

Services:

Water quality analysis

Funding Sources:

State appropriations, Federal (Hatch), university grants and aids, Sea Grant, community-funded construction of new aquaculture facility

Student Support:

Loans, hourly work, Choher research grants

Faculty/Staff:

Samuelson, Don; Instructor; M.S. in biology; experience in fisheries, water quality; 30 percent time to aquaculture.

Smith, John; Dean; Ph.D in fisheries; experience in water quality, fisheries; 5 percent time to aquaculture.

Tuition:

Resident undergraduate, \$150/term

Non-resident undergraduate, \$350/term

Admission

Criteria:

Most applicants allowed into the program

Applications

From:

Registrar; Grays Harbor College; Aberdeen, Washington 98520

48. **Institution:** University of Washington
Location: Seattle WA
Departments/
Directors: University of Washington; Seattle, WA 98195; (206) 543-4270
School of Fisheries / Dr. Donald E. Bevan
Fisheries Research Institute / Dr. Robert L. Burgner
Division of Aquaculture and Invertebrate Fisheries / Dr. Kenneth K. Chew
Division of Fisheries Science and Aquatic Ecology / Dr. Bruce S. Miller
Food Science and Technology / Dr. John Liston
Laboratory of Radiation Ecology / Dr. Roy E. Nakatani
Division of Quantitative Science in Fisheries / Dr. Douglas G. Chapman

Degrees Granted: BS, MS, Ph.D.
Current Students: 290 BS, 114 MS, 47 Ph.D. (in fisheries)
Students
Since 1970: For academic year 1979-80, 63 BS (32 in aquaculture), 19 MS (1 in aquaculture), 16 Ph.D. (3 in aquaculture)
Courses: Salmon Behavior and Life History, 3 credit hours, annually
Fisheries Genetics, 3 credit hours, annually
Reproduction of Salmonid Fishes, 3 credit hours, annually
Nutrition and Care of Fishes, 3 credit hours, annually
Salmonid Culture and Enhancement, 4 credit hours, annually
Communicable Diseases of Fishes, 5 credit hours, annually
Culture and Reproduction of Temperate and Warm Water Fishes, 3 credit hours, annually
Feeds and Diet Formulation, 3 credit hours, annually
Genetics in Fish Management and Production, 3 credit hours, annually
Shellfish Hatchery Management Techniques, 3 credit hours, annually

General
Facilities: 1 earthen pond, 1,008m² total surface area; 25 circular concrete ponds/tanks, 2,301.57m² total surface area; 50 circular plastic pools, 21.06m² total surface area; 7 raceways, 149.4m² total surface area; 14 wall tanks, 12.6m² total surface area; 24 troughs, 32.4m² total surface area

Specialized
Facilities: Fish processing technology, fish reproduction, fish nutrition, fish feed technology, aquacultural water quality, fish pathobiology, hatchery technology

Cooperators: Washington Fisheries Department, Washington Game Department, Washington Sea Grant Program, National Marine Fisheries Service, commercial growers

Project/
Objectives: Atlantic Salmon Rearing--Culture and rear Atlantic salmon.

Contribution of Genetic and Environmental Factors to the Virulence of Marine Vibrios--Unravel at the molecular level the processes which regulate the expression of virulence in *Vibrio anguillarum*, the etiologial agent of vibriosis, a major disease-causing organism in pen-reared salmonids.

Endocrine Control of Smoltification and Reproduction in Salmonids--Determine appropriate hormone treatment procedures for thyroid hormone-mediated acceleration of smoltification. Monitor thyroid hormone cycles of smoltifying salmon from breeding and selection program and nutrition studies. Analyze the dose-related effectiveness of hormone treatments for artificial induction of spawning of coho and Atlantic salmon (Sea Grant).

Coho Salmon Stock Development for Marine Pen Culture--Develop a coho salmon stock with desired traits for marine pen culture.

Optimizing Chum Salmon Culture Techniques--Identification of the effects of environmental manipulations in hatchery operations of the Washington Department of Fisheries and the Indian treaty tribes.

Influence of Chinook Smolt Size and Time of Release on Survival to Adult Return--Determine the optimum size of fall chinook at release to maximize return using both the 1981 and 1982 brood production.

Diet Development for Marine Pen-Cultured Coho Broodstock--Develop a cost-effective broodstock diet for coho salmon reared to maturity in marine net-pens.

Oyster Hatchery and Genetic Study--Produce strains of Pacific oysters which are resistant to common mortalities and grow well under commercial growing conditions.

Molluscan Culture Studies--Improve the culturing of mussels by investigating a potential predation-resistant species (*M. californianus*) in comparison with *M. edulis*, and develop methodologies for rearing juvenile pinto abalone (*M. kamtschatkana*) in the hatchery for future transplant to grow-out areas.

Services: Disease diagnosis, feed analysis, water quality analysis, information services (reprints, publications)

Funding Sources: Federal (Hatch), university grants and aids, Commercial Oyster Growers Association

Student Support: Loans, grants, hourly work, teaching assistantships, research assistantships

Faculty/Staff: Brannon, Ernest; Associate Professor; Ph.D. in fisheries; experience in salmon aquaculture; 100 percent time to aquaculture.

Chew, Kenneth K.; Professor; Ph.D. in fisheries; experience in aquaculture and invertebrate fisheries; 100 percent time to aquaculture.

Crosa, Jorge; Ph.D.

Dickhoff, Walton W.; Research Associate; Ph.D.; 50 percent time to aquaculture.

Halver, J.E.; Professor; Ph.D. in fisheries; experience in fish nutrition; 50 percent time to aquaculture.

Hardy, Ronald W.; Research Assistant Professor; Ph.D. in fisheries; experience in fish nutrition; 100 percent time to aquaculture.

Hershberger, William K.; Associate Professor; Ph.D. in fisheries; experience in fish genetics; 50 percent time to aquaculture.

Landolt, Marsha; Associate Professor; Ph.D. in fisheries; experience in fish diseases and pathology.

Nakatani, Roy E.; Professor; Ph.D. in fisheries; experience in fisheries research and aquaculture administration; 10 percent time to aquaculture.

Salo, Ernest O.; Professor; Ph.D. in fisheries; experience in chum culture and administration; 50 percent time to aquaculture.

. Simenstad, Charles A.; M.S. in fisheries biology; experience in

fish food habits; 50 percent time to aquaculture.

Smith, Lynwood S.; Professor; Ph.D. in fisheries; experience in fish physiology; 50 percent time to aquaculture.

Wissman, Robert C.; Research Associate Professor; Ph.D.; experience in carbon flow in ecosystems and food of fishes; 50 percent time aquaculture.

Tuition: Resident undergraduate, \$353/quarter
Resident graduate, \$413/quarter
Non-resident undergraduate, \$1,016/quarter
Non-resident graduate, \$1,200/quarter
Tuition is not waived for supported graduate students

Admission Criteria: Grade point average, test scores (ACT, SAT, GRE), personal recommendations, personal interest and goals

Applications From: For graduate studies: Graduate Program Advisor; School of Fisheries; For undergraduate studies: Registrar's Office; Admissions; University of Washington, Seattle, WA 98195

WISCONSIN

49. Institution: University of Wisconsin-Madison
Location: Madison, WI
Departments/Directors: University of Wisconsin-Madison; 1605 Linden Drive; Madison, WI 53706

Degrees Granted: MS, Ph.D.
Current Students: 5 MS, 1 Ph.D.

Students Since 1970: 12 MS, 2 Ph.D.
Courses: Introduction to Ecology, 3 credit hours, annually
General Invertebrate-Zoology, 3 credit hours, annually
Ecology of Fishes, 4 credit hours, annually
Hydrobiology, 4 credit hours, annually
Aquatic Insects, 4 credit hours, annually
Biology of Aquatic Populations, 3 credit hours, annually
Problems in Oceanography, 3 credit hours, annually
Oceanography and Limnology Seminar, 1 credit hour, annually
Water Chemistry, 3 credit hours, annually
Water Analysis, 3 credit hours, annually
Marine Chemistry, 2 credit hours, annually
Ocean Environment, 1-4 credit hours, annually

General Facilities: 3 earthen ponds, 1.2 ha total surface area; 10 concrete ponds/tanks, 1,440m² total surface area; 80 plastic pools

Specialized Facilities: Fish processing technology, fish reproduction, fish nutrition, fish feed technology, hatchery technology, aquacultural engineering

Cooperators: Department of Natural Resources, Great Lakes Sea Grant Committee, USDA, Sea Grant, Department of Commerce

Project/Objectives: Assessment of the Feasibility of Combined Pond and Cage Culture of Yellow Perch.

Larval Feeding of Coolwater Fish.

An Economic Simulation and Evaluation of Open Pond Rearing of Perch.

Amino Acid Catabolism in Rainbow Trout.

Amino Oxidation and its Application to Diet Formulation in Rainbow Trout.

Assessment of Dietary Amino Acid Requirements of a Representative Great Lake Fish.

Control of Sexual Differentiation in Yellow Perch.

Basic Husbandry of Great Lakes Fishes.

Information services (reprints, publications)

Services:
Funding Sources: State appropriations, Federal (Hatch), university grants and aids, Sea Grant

Student Support: Loans, grants, hourly work, research assistantships

Faculty/Staff: Amundson, C.H.; Professor; Ph.D. in engineering; 20 percent time to aquaculture.

Armstrong, A.; Professor; Ph.D. in water chemistry; 10 percent time to aquaculture.

Bowser, C.J.; Professor; Ph.D. in geology and geophysics; 10 percent time to aquaculture.

Kayes, T.B.; Assistant Scientist; Ph.D. in biology; 100 percent time to aquaculture.

Kim, K.I.; Research Specialist; Ph.D. in nutrition; 100 percent time to aquaculture.

Kitchell, J.; Associate Professor; Ph.D. in zoology; 10 percent time to aquaculture.

Magnusson, John; Professor; Ph.D. in oceanography/limnology; 10 percent time to aquaculture.

Tuition: Resident undergraduate, \$522.50/term

Resident graduate, \$715/term

Non-resident undergraduate, \$1,816/term

Non-resident graduate, \$2,173/term

Out-of-state tuition is waived for supported graduate students

Admission

Criteria: In order of importance: Grade point average, personal recommendations, test scores (ACT, SAT, GRE)

Applications

From: C.H. Amundson; Department of Food Science; University of Wisconsin-Madison; 1605 Linden Drive; Madison, WI 53706

Section II.

Associations and Government Organizations

ALABAMA

50. **Name:** Alabama Catfish Farmers (division of the Alabama Farm Bureau Federation)
 Type: Farm Bureau
 Address: P.O. Box 11000, Montgomery, AL 36198; (205) 288-3900
Inquiries To: Jimmy Carlisle, Director Catfish Division
 Key Staff/
 Members: Carlisle, Jimmy; Director Catfish Division
 Easterling, William; Past Chairman
 Jones, Lee
 Jones, W. P.
 Kyser, Bill; Chairman, serves on CFA Board of Directors
 Miller, Neal; 1st Vice Chairman
 Montz, Lenson
 Pearce, David; Former officer and committee member, Past President of CFA
 Smith, O. D.
 Spree, Thed; 2nd Vice Chairman
 Stringer, Phillip
 Taylor, Milton
 Services: Information, organizational and legislative
 Goals: Develop a county and state organizational structure that is responsive to the needs of catfish farmers in Alabama; cooperate with all organizations interested in aquaculture development and vigorously support aquaculture as a vital segment of agriculture; promote the farm-raised catfish industry; strengthen the catfish industry through the legislative process

 Publications: *Net Gains Newsletter; Neighbors Magazine.*
Available From: Jimmy Carlisle, P.O. Box 11000, Montgomery, Alabama 36198
51. **Name:** Alabama Cooperative Extension Service
 Address: Duncan Hall, Auburn University, AL 36849
Inquiries To: Dr. John Jensen, Fisheries Specialist
 Status: Cooperative
 User
 Criteria: Geographical location - Alabama; commodity - commercial and recreational aquaculture and fish bait production; organizations must be non-discriminatory as to race, religion, sex, etc.
- Aquaculture**
 Staff: Jensen, John; Aquaculture Extension Specialist; extension programs dealing with aquaculture
 Wade, Larkin; Head, Extension Natural Resources; staff group coordination
 Multi-county specialized agent-aquaculture; educational programs in commercial and recreational aquaculture in six counties of West Alabama
- Aquaculture**
 Programs: Extension
 Priority
 Services: Extension education programs in commercial aquaculture, recreational aquaculture, and processing and marketing of aquacultural products

 Goals: Short term - to increase the pond owner's knowledge and improve his skills in management of ponds; to promote the adoption of new technology by the commercial catfish producer; to identify and address the problems of Alabama's bait minnow industry; Long term (by 1985) - to increase fishing occasions on Alabama waters; increase catfish production 11 percent; increase

processing capacities by 35 percent

Publications: *Channel Catfish Production in Ponds. Circular ANR-195; Lining Fish Ponds. ANR-232; Weed Control in Lakes and Farm Ponds. Circular ANR-48.*

Available From: Asst. Head, Information Services, Alabama Cooperative Extension Service, Auburn University, Alabama 36849

52. Name: **Alabama Cooperative Fishery Research Unit**

Address: U.S. Fish and Wildlife Service, Swingle Hall, Auburn University, AL 36849

Inquiries To: Dr. William L. Shelton

Status: Cooperative

Aquaculture Staff: Ramsey, Dr. John S.; Unit Leader; taxonomic work with aquacultural species
Shelton, Dr. William L.; Assistant Leader; spawning and sex manipulation research

Aquaculture Programs: Research

Priority Services: Research on enhancing fish seed production, monosex stocks for weed control/aquaculture, knowledge on fish genetics

Goals: Continue research and improve on fish seed production; monosex stock production; knowledge of fish genetics

Publications: Bibliography.

Available From: Publications Clerk, Fisheries Bldg., Auburn University, AL 36849

53. Name: **U.S. Fish and Wildlife Service, National Fisheries Center, Southeastern Fish Cultural Laboratory**

Address: Route 3, Box 86, Marion, AL 36756; (205) 683-6175

Inquiries To: Nick C. Parker, Scientific Director

Status: Federal

Aquaculture Staff: Geiger, James G.; Biochemistry Section Leader; investigates biochemical requirements for zooplankton and larval fish and impact of fishery use chemicals on these populations
Parker, Nick C.; Acting Scientific Director; conducts and directs research in warmwater fish physiology and bioengineering for fish culture systems
(vacant); Physiology Section Leader; investigates physiology of warmwater fishes to enhance aquaculture production
(vacant); Fish Culture Section Leader; investigates techniques and practices to enhance production of warmwater fish in ponds
(vacant); Bioengineering Section Leader; investigates intensive culture systems and develops hardware and techniques to enhance aquaculture production

Aquaculture Programs: Research, information transfer, demonstrations

Priority Services: Research, information transfer, aquaculture demonstrations

Goals: Produce basic research information supporting expansion of U.S. aquaculture and provide recommendations to private, state, and Federal aquaculturists

Information Available From: Scientific Director, Southeastern Fish Cultural Laboratory, Marion, Alabama 36756

54. **Name:** Fisheries Section, Alabama Game and Fish Division
 Address: 64 North Union, Montgomery, AL 36104
 Inquiries To: Barry W. Smith, Game and Fish Division
 Status: State
 User Obligation: Pay a fee, submit a formal request
 User:
 Criteria: Catfish ponds
 Aquaculture
 Staff: Harders, Fred; District II Management Biologist
 Johnson, Larry; District V Management Biologist
 Lawson, Curtis; District I Management Biologist
 Newman, Michael; District VI Management Biologist
 Thompson, Dan P.; District IV Supervisor (Management Biologist)

 Walls, L. E.; District III Supervisor - Research and Management
 Aquaculture
 Programs: Provision of largemouth bass fingerlings on a one-time basis
 for catfish ponds

 Priority
 Services: Provision of largemouth bass fingerlings; technical advice to
 commercial fish-out operators

 Goals: Division is sportfish oriented and provides services primarily
 to commercial operations that provide sportfishing
 opportunities
 Information
 Available From: Fisheries Section, Alabama Game and Fish Division, 64 N. Union,
 Montgomery AL 36104

ALASKA

55. **Name:** Alaska Fisheries Council
 Address: Office of the Governor, Pouch AN, Juneau AK 99811
 Inquiries To: W.I. "Bob" Palmer, Special Projects Coordinator, Office of the
 Governor
 Curt Kerns, Chairman, Alaska Fisheries Council, Office of the
 Governor
 Status: State
 Aquaculture
 Staff: Kerns, Curt; Chairman, Alaska Fisheries Council and Associate
 Professor, University of Alaska; aquaculture specialist.
 Palmer, W.I.; Special Projects Coordinator; executive and
 legislative liaison for the aquaculture program

 Aquaculture
 Programs: Planning, executive and legislative coordination

 Priority
 Services: To developing a statewide, long-range, multifaceted program for
 the restoration of Alaska's fisheries; to achieve executive,
 legislative, and voter approval of bond issues for State
 hatchery production of salmonids; to coordinate and develop the
 statewide private nonprofit hatchery system

 Goals: To recommend necessary legislation to implement new programs or
 maintain existing programs; long-term goal to restore the
 salmon returns to the historic level of over 100 million
 harvestable returns

56. **Name:** Alaska Department of Fish and Game, Division of Fisheries
 Rehabilitation, Enhancement, and Development
 Address: P.O. 3-2000, Juneau, AK 99802; (907) 465-4160
 Inquiries To: Mark Kissel, Publications Specialist
 Status: State
 User Obligation: Submit a formal request
 User:
 Criteria: State of Alaska; services are provided in the course of the

permitting process for private nonprofit hatcheries and to hatcheries with valid permits

Aquaculture

Staff:

Barrick, Lowell; Chief Engineer; design and engineering
Burkett, Dr. Robert; Chief of Technology and Development; research and quality control
Crandall, Karen; Mark-Tag Recovery Coordinator; mark and tag recovery
Davis, Dr. Bob; Principal Geneticist; genetics
Grischkowsky, Dr. Roger; Principal Pathologist; pathology
Kepshire, Dr. Bernard; Principal Fish Culturist; fish culture
Koenings, Dr. Jeff; Principal Limnologist; lake fertilization and lake stocking
Leon, Dr. Ken; Principal Biologist; biology
Madden, Jerry; Acting Chief of Operations; program direction and oversight of the private nonprofit aquaculture sector
McMullen, John C.; Acting Director; program direction

Aquaculture

Programs:

Research, production

Priority

Services:

Fish health inspections, disease diagnosis, limnological analyses

Goals:

Bring the 20 public hatcheries now on line to full production (672.1 million eggs). FY 83 egg-take goal is 350 million eggs

Publications:

Report on the Fish Creek Estuarine Rearing Facility. Alaska Department of Fish and Game Report, 1976; Crab Softshell Disease Investigations (July 1977 sample collection), Bacteriology and Histopathology. Alaska Department of Fish and Game Report (preliminary), 1977; The Kasilof Hatchery. Division of Fisheries Rehabilitation, Enhancement and Development visitor's booklet.

Available From:

ADF and G, FRED Division, 333 Raspberry Road, Anchorage, AK 99502

ARKANSAS

57. Name:

Catfish Farmers of Arkansas

Type:

Producer Association

Address:

Rte. 2, Box 185, Carlisle, AR 72024; (501) 854-5187

Inquiries To:

Debbye Harrison; Executive Secretary

Key Staff/

Members:

Finley, Wade; President
Harrison, Debbye; Executive Secretary
McNulty, Ted; Vice President
Olson, Dr. Carroll; Secretary-Treasurer

Services:

Information, newsletter

Goals:

Promote farm-raised catfish in Arkansas

Publications:

Catfish Farmers of Arkansas Newsletter.

Available From:

Debbye Harrison, Rt. 2, Box 185, Carlisle, Arkansas 72024

58. Name:

Fish Farming Experimental Station, U.S. Fish and Wildlife Service

Address:

P.O. Box 860, Highway 130 E, Stuttgart, AR 72160; (501) 673-7710

Inquiries To:

Extension Biologist

Status:

Federal

Aquaculture

Staff:

Carter, Ray; Fishery Biologist; Fisheries Management
Dupree, Harry K.; Laboratory Director; Feeds and Nutrition
Gill, Robert L.; Equipment Specialist

Hoffman, Glenn L.; Parasitologist; Fish Diseases
 Martin, J. Mayo; Extension Biologist; General Aquaculture
 Mitchell, Andrew J.; Fisheries Biologist/Diagnostician; Fish
 Diseases
 Tackett, Dewey L.; Chemist; Water Quality Management

Aquaculture
Programs: Research, extension, diagnostics
Priority
Services: Extension assistance, diagnostics assistance, husbandry
 research
Goals: Extension and diagnostics assistance to practicing and
 potential fish producers; research and development information
 on feeds and nutrition, selective breeding, fish diseases, and
 water quality management to the aquacultural industry
Publications: Bibliography available.
Available From: Librarian, P.O. Box 860, Hwy. 130 E, Stuttgart, AR 72160

59. **Name:** Arkansas Cooperative Extension Service
Address: 1201 McAlmont, Box 391, Little Rock, AR 72203; (501) 373-2637
Inquiries To: D. Leroy Gray, Extension Fish and Wildlife Biologist
Status: State
Aquaculture
Staff: Gray, Leroy D.; Extension Fish and Wildlife Biologist
Aquaculture
Programs: Extension
Priority
Services: Education programs, information on production of food fish,
 production of bait, water quality consultation
Goals: Improve processing and marketing of foodfish, improve water
 quality, improve water reuse
Publications: *Manual for Baitfish Culture in the South; Farm Pond Management;*
The Biology of Channel Catfish Production.
Available From: D. Leroy Gray, Extension Fish and Wildlife Biologist

60. **Name:** Arkansas Game and Fish Commission
Address: Two Natural Resources Drive, Little Rock, AR 72205
Inquiries To: Mike Freeze, Special Projects Coordinator
Status: State
Aquaculture
Staff: Beavers, Berry; Hatchery Manager; extension
 Crawford, Tommie; Fisheries Biologist II; annual aquaculture
 survey, research and extension
 Freeze, Mike; Special Projects Coordinator; annual aquaculture
 survey, research concerning aquaculture and extension
 Hays, Tom; Hatchery Manager; extension
Aquaculture
Programs: Research, extension
Priority
Services: Annual aquaculture survey for the state; extension services
 (pond construction, weed control, disease diagnosis); various
 research projects addressing specific aquacultural problems
Goals: Continue annual monitoring of aquaculture industry; continue to
 provide extension services that promote industry growth;
 continue utilizing hatchery facilities to analyze various
 aquacultural problems
Publications: Bibliography.
Available From: Mike Freeze, Joe Hogan State Fish Hatchery, P.O. Box 178,
 Lonoke, AR 72086

ARIZONA

61. **Name:** **Arizona Game and Fish Department**
 Address: 2222 W. Greenway Road, Phoenix, AZ 85023
Inquiries To: Kenneth Hanks, State Hatchery Supervisor
 Status: State
 User:
 Criteria: State resident
Aquaculture
 Staff: Hanks, Kenneth; Hatchery Supervisor; fish culture information
Aquaculture
 Programs: Information service
 Priority
 Services: Fish farm information; fish cultural booklets; water quality
 criteria information
 Goals: Help foster the growth of the aquaculture industry in Arizona

CALIFORNIA

62. **Name:** **California Aquaculture Association**
 Type: Trade Organization
 Address: P.O. Box 110, Monterey CA 93942; (408) 646-8315
Inquiries To: George Lockwood, Chairman
 Key Staff/
 Members: Brown, Keith; President
 Hulbrock, Bob; Treasurer
 Lockwood, George; Chairman
 Ray, George; Secretary
 Vaught, Tony; Vice President
 Services: Technical/advisory, information, represent the industry on
 policy issues
 Goals: Support the growth and development of aquaculture in
 California; participate in the formulation of an aquaculture
 plan for California.
 Publications: Membership information available.
Available From: California Aquaculture Association, P.O. Box 110, Monterey, CA
 93942

63. **Name:** **California Department of Fish and Game**
 Address: 1416 Ninth Street, Sacramento, CA 95810; (916) 445-8386
Inquiries To: Charles E. Fullerton, Director, Department of Fish and Game
 Status: State
User Obligation: Payment of a fee (disease and parasite inspection, etc.);
 submit a formal request (leasing of state waters, importation,
 etc.); licensing
Aquaculture
 Staff: Cordone, Almo J.; Senior Fishery Biologist; provides
 information on procedures and regulations on freshwater
 aquaculture, and provides identification and control
 information for fish resources
 Dahlstrom, Walter A.; Associate Marine Biologist; field
 supervision of state oyster leases and provision of direct
 technical assistance to growers
 Ebert, Earl E.; Senior Marine Biologist; Supervisor of State
 Marine Culture Laboratory, provides technical assistance to
 growers
 Hazeltine, Arthur; Associate Marine Biologist; saltwater
 hatchery technology
 Manzer, Don; Senior Fish Pathologist; provides identification

and control information for diseases and parasites
Smith, Jr., Emil J.; Senior Marine Biologist; provides marine
aquaculture information and coordinates leasing of state
water bottoms
Wingfield, William; Virologist; provides identification and
control information for fish viruses

Aquaculture

Programs: Research, disease control, regulation

Priority

Services: Disease control, technological development, leasing of state
water bottoms for aquaculture use

Goals: Long Term - maintain certification of shellfish growing waters,
develop and implement a statewide aquaculture plan, develop
production technology for fresh and saltwater fish and
shellfish. Short Term - develop methodology to reestablish use
of San Francisco Bay for shellfish production, rebuild wild
abalone stocks through aquaculture, set aside tidelands in
local coastal plains to ensure expanded shellfish production
Publications: *Trout and Salmon Culture*, *Fish Bulletin* 164; *Regulations*
Governing Mariculture and Oyster Cultivation, *Marine Resources*
Information Leaflet; *Regulations Governing Domesticated Fish*
Breeder's License, *Inland Fisheries Informational Leaflet* No.
8.

Available From: 1.-Publications, Division of Agricultural Sciences, 1422 Harbor
Way South, Richmond, CA 94804; 2 and 3.-California Department
Fish and Game, Sacramento.

64. Name: West Coast Aquaculture Foundation

Type: Nonprofit Educational Organization

Address: 700 Cannery Row, Suite JJ, Monterey, CA 93940; (404) 646-1217

Inquiries To: Dr. John L. Dupuy, Executive Director; Henrietta Stern,
Information Specialist

Key Staff/

Members: Beer, Ken; Treasurer

Dupuy, Dr. John L.; Executive Director

Johnson, Howard; Secretary

McMillin, Dave; Vice President

Olst, Jack Van; Vice President

Ray, George; President and Chairman of the Board

Stern, Henrietta; Information Specialist

Services: Technical/advisory, information, market assessment study funded
through USDA of aquaculture of the West Coast States, Hawaii,
and U.S. Trust Territories

Goals: Encourage the development of aquaculture in the Western States
by acting as a clearinghouse for information and as a focal
point to address the planning requirements for the West Coast
region; assist in the development of an aquaculture plan by
providing a forum for the development of policies which will
aid the industry in developing to its full potential.

Publications: *West Coast Aquaculture Foundation Statement of Purpose*; *West*
Coast Aquaculture Foundation Newsletter, Vol. 1, No. 1; *West*
Coast Aquaculture Foundation Newsletter, Vol. 1, No. 2.

Available From: West Coast Aquaculture Foundation, 700 Cannery Row, Suite JJ,
Monterey, CA 92940 (Newsletters are quarterly publications,
available only to members)

COLORADO

65.	Name:	U.S. Fish and Wildlife Service
	Address:	Fish Disease Control Center, P.O. Box 917, Ft. Morgan, CO 80701
	Inquiries To:	Dennis E. Anderson, Director
	Status:	Federal
User Obligation:		Submit a formal request
	User	
	Criteria:	Provides services if they are not available from other labs
	Aquaculture	
	Staff:	Barney, Phyllis; Hatchery Biologist; fish health extension services
		Janeke, Paul; Hatchery Biologist; inspection/diagnostics
	Aquaculture	
	Programs:	Extension, workshops/training courses
	Priority	
	Services:	Fish health inspection, fish disease diagnoses; extension services (fish health-related environmental testing, treatment recommendations)

CONNECTICUT

66. **Name:** National Marine Fisheries Service, Northeast Fisheries Center, Milford

Address: 212 Rogers Avenue, Milford, CT 06460-6499

Inquiries To: Dr. James E. Hanks, Laboratory Director

Status: Federal

User Obligation: Submit a formal request (letter adequate)

User

Criteria: Active in field of molluscan aquaculture R and D

Aquaculture

Staff: Blogoslawski, Dr. Walter J.; Research Microbiologist; diseases of larval and juvenile mollusks

 Brown, Dr. Carolyn; Research Microbiologist; diseases of larval and juvenile mollusks

 Goldberg, Ronald; Fishery Biologist; culture methods (mollusks)

 Hanks, Dr. James E.;

 Longwell, Dr. Arlene C.; Research Geneticist; genetics

 Rhodes, Edwin W.; Fishery Biologist; culture methods (mollusks)

 Robohm, Dr. Richard A.; Research Microbiologist; diseases of larval and juvenile mollusks

 Stiles, Sheila S.; Research Geneticist; genetics

 Ukeles, Dr. Ravenna; Research Microbiologist; nutrition of larval and juvenile mollusks, algal culture methods

 Wikfors, Gary H.; Research Microbiologist; nutrition of larval and juvenile mollusks, algal culture methods

Aquaculture

Programs: Research, on-the-job training

Priority

Services: Assessment of disease and water quality problems at commercial hatcheries; providing starter cultures of marine algae for hatchery operators; provide training in molluscan culture methodology

Goals: Development of techniques/methods for culture of marine mollusks to the level of commercial feasibility, to include studies in genetics, disease, nutrition and algal culture (short and long term)

Publications: *The role of raceways in mariculture systems for the bay scallop, Argopecten irradians irradians, and the surf clam,*

Spisula solidissima. In: *Nursery Culturing of Bivalve Molluscs*, pp. 227-251. European Mariculture Society Special Publication No. 7.; Experimental inbreeding and hybridization in the commercial American oyster. ICES, Mariculture Committee. C.M.1979/F:43.; A study of two shellfish-pathogenic *Vibrio* strains isolated from a Long Island hatchery during a recent outbreak of disease. *Journal of Shellfish Research*, 1(1): 83-87; Growth and adaptation of estuarine unicellular algae in media with excess copper, cadmium or zinc, and effects of metal-contaminated algal food on *Crassostrea virginica* larvae. *Marine Ecology - Progress Series* 7: 191-206.

Available From: Librarian (as available)

67. **Name:** Aquaculture Division, Department of Agriculture
 Address: P.O. Box 97, Milford, CT 06460
 Inquiries To: John H. Volk, Division Chief
 Status: State
User Obligation: None for advisory services and information; fee for shellfish ground leasing and related survey work

User
 Criteria: Connecticut state waters, for marine operations
 Aquaculture
 Staff: Provost, Patricia; Administrative Secretary; collects and records revenue from shellfish ground leases and franchises, and processes and reviews lease applications
 Speer, Jr., LeRoy E.; Boat Captain; operates division survey boats utilized in lease surveys, resource assessments, and shellfish sample programs
 Volk, John H.; Division Chief; directs division activities, coordinates programs related to aquaculture with state and Federal agencies, provides technical service to shellfish industry
 Zaikowski, Edwin F.; Maintainer II; serves as engineer and skilled deck crew for division survey boats

Aquaculture
Programs: Research, extension
Priority
Services: Leasing of shellfish grounds, surveying and buoying leases; maintenance lease records and tax lists; supportive assistance to state and Federal agencies and industry for water quality, resource assessment, and marine research programs

Goals: Administration of 40,000 acres of leased, franchised, and natural shellfish beds; resource assessment studies for existing and future shellfish management policies; expansion of advisory service for technical assistance to shellfish industry

Publications: *State of Connecticut Laws Relating to Shell-Fisheries*; *Index of Oyster Grounds - Leasing Procedures*; Connecticut shellfish ground maps.

Available From: Aquaculture Division, P.O. Box 97, Milford, CT 06460

DISTRICT OF COLUMBIA

68. **Name:** Extension Service, USDA, Natural Resources Unit
 Address: Room 3428 South Bldg., Washington, DC 20250; (202) 447-5468
 Inquiries To: James E. Miller, Program Leader, Fish and Wildlife
 Status: Federal Extension Educational Programs
User Obligation: No obligation, submit a formal request, educational information provided as requested and as needs determined, leadership provided to extension service nationally and to State Cooperative Extension Services

User
 Criteria: Need must be met through the educational process and will include the interpretation of research, transfer of technology, and use of educational programs to assist the implementation of improved aquacultural management and development.

Aquaculture Staff: Miller, James E.; Program Leader, Fish and Wildlife; provides national leadership for Extension Service, USDA. State Cooperative Extension Service fisheries and aquaculture specialists provide State leadership to aquaculture programs in the States.

Aquaculture Programs: Extension, educational

Aquaculture Priority Services: Leadership for extension educational programs; support, cooperation, coordination, and liaison with other Federal and State agencies and organizations and associations to improve extension programs; management, disease prevention and control, economics, marketing, etc.

Goals: Expand aquacultural extension educational programs in states with significant potential and/or existing aquaculture industry to provide the educational component and programs, to help landowners/managers evaluate alternatives, and to improve the management and profitability of their aquacultural enterprise. Also to identify needed research and interpret existing research, to implement educational programs that will increase production and marketability.

Information Available From: Respective State Cooperative Extension Services.

69. Name: **National Science Foundation**

Address: 1800 G Street, NW, Washington, DC 20550; (202) 357-7527

Inquiries To: Ritchie Coryell, Division of Industrial Science and Technological Innovation, Small Business Innovation Research Program

Status: Federal

User Obligation: Submit a formal request

User Criteria: Scientific merit of research

Aquaculture Staff: Penhale, Polly; Assistant Program Director, Division of Ocean Sciences; Director of Evaluation Process for Small Business Innovation Research Grants for Marine Aquaculture
Redfield, Garth; Associate Program Director, Division of Environmental Biology; Director of Evaluation Process for Small Business Innovation Research Grants for Freshwater Aquaculture

Aquaculture Programs: Research

Aquaculture Priority Services: Provision of the Small Business Innovation Research Program: Marine Resources Topic

Goals: Support aquacultural research with potential for commercial innovation

70. Name: **U.S. Environmental Protection Agency**

Address: 401 M Street, S.W., Washington, DC 20460; (202) 755-4911

Inquiries To: Robert K. Bastian, Environmental Scientist, Office of Water Program Operations (WH-456)

Status: Federal

Aquaculture Staff: Bastian, Robert K.; Environmental Scientist, Office of Water Program Operations (WH-456); encourages greater use of aquaculture processes for treatment and recycling of municipal wastewater
Duffer, William R.; Project Officer (Robt. S. Kerr Environmental Research Laboratory; research and development in the use of aquaculture processes for wastewater treatment
Kasaoka, Gary S.; Project Officer (Effluent Guidelines Division WH-552); food processing discharge guidelines

Aquaculture Programs: Research, waste treatment regulation, and financial assistance to publicly owned treatment works

Priority Services: Waste treatment regulation, financial assistance to publicly owned treatment works, research and development and assistance in development of waste treatment practices

Goals: Encourage greater use of innovative and alternative waste treatment technologies which beneficially recycle wastes into usable products, conserve energy, and decrease total cost; protection of receiving waters from waste treatment discharges

Publications: Aquaculture Systems for Wastewater Treatment: An Engineering Assessment June 1980 EPA 430/9-80-007 (June '80) Office of Water Program Operations; Aquaculture Systems for Wastewater Treatment: Seminar Proceedings and Engineering Assessment EPA 430/9-80-006 (Sept. '79) Office of Water Program Operations; Benefits and Implementation Potential of Wastewater Aquaculture, Office of Water Regulations and Standards, Criteria and Standards (May '82); Report to Congress, Section 74, Seafood Processing Study, Executive Summary EPA 440/1-80/020 (Sept. '80) Office of Water and Waste Management, Effluent Guidelines.

Available From: Offices sponsoring the publication or National Technical Information Service

71. Name: Fish and Wildlife Service, U.S. Department of the Interior

Address: Fish and Wildlife Service, U.S. Department of the Interior, Washington, DC 20240

Inquiries To: Information about FWS aquaculture programs: Dr. Kenneth O. Allen; Requests for aquaculture technical information: Joseph P. McCraren. See additional entries of Fish and Wildlife service under other headings

Status: Federal

Aquaculture Staff:

- Allen, Dr. Kenneth O.; Aquaculture Specialist, Division of Fishery Ecology Research, Washington, DC; Senior Staff Specialist for Aquaculture
- Barnes, Willie R.; Manager, Aquaculture Production/Demonstration Station, National Fisheries Center, Leetown, WV; supervises station activities, which include maintenance and testing of trout strains
- Bishop, Harry; Director, National Fish Hatchery and Development Center, San Marcos, TX; supervises development of strains of largemouth and striped bass and other warmwater species
- Bullock, Dr. Graham L.; Scientific Director, National Fish Health Research Laboratory, Leetown, WV; supervises the laboratory (fish health research)
- Daugherty, William E.; Chief, Division of Hatcheries and Fishery Resource Management, Washington, DC; Chief Contact for National Fish Hatcheries, Fish Cultural Development Centers, and Hatchery Biologist
- Dupree, Dr. Harry K.; Scientific Director, Fish Farming Experimental Station, Stuttgart, Arkansas; supervises station activities, which include warmwater research and extension
- Fox, Dr. Al; Director, Seattle National Fishery Research Center, Seattle, Washington; supervises the laboratory, including research of diseases of Pacific salmon
- Kincaid, Dr. Harold L.; Fish Geneticist, Fish Geneticist Station, National Fisheries Center, Leetown, WV; lead geneticist for the Service
- Leith, David A.; Director, Abernathy Salmon Culture Development Center, Longview, WA; supervises development of diets, broodstock, and cultural techniques for salmon

Mann, Joyce A.; Technical Information Officer, National Fisheries Center, Leetown, WV; distributes technical information

McCraren, Joseph P.; Aquaculture Technical Coordinator, National Fisheries Center, Leetown, WV; coordinates technical information transfer

McDaniel, David W.; Acting Director, National Fisheries Center, Leetown, WV; Administrator for the National Fisheries Center Complex

Odgen, Wendel S.; Superintendent, Fisheries Academy, National Fisheries Center, Leetown, WV; supervises Service's aquaculture training programs

Parker, Dr. Nick C.; Scientific Director, Southeastern Fish Cultural Laboratory, Marion, Alabama; supervises laboratory, including research of striped bass and other warmwater species

Piper, Robert G.; Director, Fish Cultural Development Center, Bozeman, MN; supervises development related to coldwater species

Stevens, Dr. Robert E; Chief, Division of Fishery Ecology Research, Washington, DC; Aquaculture Coordinator (program director)

Trandahl, Arden J.; Director, Spearfish Fisheries Center and Diet Testing Development Unit, Spearfish, SD; supervises culture and diet development of trout

Aquaculture Programs: Research, non-academic training, disease identification and consultation, seedstock acquisition assistance, supply fish biologics, drug registration

Priority Services: Preparation and distribution of aquaculture information; research into husbandry areas such as diseases, nutrition, and water quality; drug registration activities; assist aquaculturists with obtaining seedstock

Goals: Provide Federal leadership in fish husbandry technology, implement the National Aquacultural Act of 1980 by assisting in the development of aquaculture, serve as chairman of the Joint Subcommittee on Aquaculture during calendar years 1982 and 1983

Publications: *Fish Health News; Sport Fishing Abstracts; The Progressive Fish-Culturist; Trout Strain Registry; Manual for Bait Fish Culture in the South; Directory of Fish and Wildlife Service Aquaculture Capabilities; Control of Bird Damage at Aquaculture Facilities; Fish Disease Leaflets.*

Available From: Technical Information Services, National Fisheries Center, Box 700, Kearneysville, WV 25430

72. Name: National Marine Fisheries Service

Address: Office of Science and Environment, Washington, DC 20235; (202) 634-7466

Inquiries To: Ben Drucker

Status: Federal

Aquaculture Staff: Bailey, Jack; Project Leader; estuarine determination of salmon survival in Alaska (carrying capacity studies); National Marine Fisheries Service, Auke Bay Laboratory, P.O. Box 155, Auke Bay, AK 99821, (907) 789-7231

Blogoslawski, Dr. Walter; Project Leader; molluscan diseases; National Marine Fisheries Service, Milford Laboratory, Milford, CT 06460, (203) 878-2459

Caillouet, Dr. Charles; Chief, Division of Environmental Research and Aquaculture; crustacean culture; National Marine Fisheries Service; Galveston Laboratory, 4700 Avenue U, Galveston, TX 77550, (713) 763-1211

Drucker, Ben; Senior Research Specialist - Aquaculture;

aquaculture overview and coordination; National Marine Fisheries Service, Washington, DC 20235, (202) 634-7466
Hanks, Dr. James; Laboratory Director; molluscan aquaculture; National Marine Fisheries, Milford Laboratory, Milford, CT 06460, (203) 878-2459
Harrell, Dr. Lee; Pathologist; disease studies (primarily salmonids), Atlantic salmon enhancement program; National Marine Fisheries Service, Manchester Marine Experimental Station, P.O. Box 38, Manchester, WA 98353, (206) 842-7181
Heard, William; Project Leader; salmon aquaculture development for Alaska (ocean ranching); National Marine Fisheries Services, Auke Bay Laboratory, P.O. Box 155, Auke Bay, AK 99821, (907) 789-7231
Longwell, Dr. Arlene; Project Leader; molluscan genetics; National Marine Fisheries Service, Milford Laboratory, Milford, CT 06460, (203) 878-2459
Mahnken, Conrad; Project Leader; salmon culture; National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Coastal Zone and Estuarine Studies Division, 2725 Montlake Boulevard East, Seattle, WA 98112, (207) 442-4760
Rhodes, Edwin; Project Leader; molluscan culture methodology; National Marine Fisheries Service, Milford Laboratory, Milford, CT 06460, (203) 878-2459
Rosenfield, Dr. Aaron; Laboratory Director; disease studies; National Marine Fisheries Service, Oxford Laboratory, Oxford, MD 21654, (301) 226-5193
Spinelli, Dr. John; Director, Utilization Research Division; nutrition (primarily salmonids); National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Coastal Zone and Estuarine Studies Division, 2725 Montlake Boulevard East, Seattle, WA 98112, (206) 442-4564
Ukeles, Dr. Ravenna; Project Leader; molluscan nutrition; National Marine Fisheries Service, Milford Laboratory, Milford, CT 06460, (203) 878-2459

**Aquaculture
Programs:
Priority
Services:**

Research

Goals:

Provide scientific base for aquaculture development through research and development; disseminate information; coordinate aquaculture activities with other Federal agencies

Long Term - to have public hatcheries or private husbandry increase production of selected species that are in short supply. Short Term - to provide the scientific and technical base needed for the development of aquaculture in cooperation with other agencies and groups, and to facilitate early application of research results by information dissemination

Publications:

The mass culture of the rotifer, Branchionus plicatilis, for use as foodstuff in aquaculture. Proc. World Maricult. Soc. 11:211-218.; Some aspects of the controlled production of the bay scallop (Argopecten irradians). Proc. World Mariculture Society 11:235-246; A study of two shellfish-pathogenic Vibrio strains isolated from a Long Island hatchery during a recent outbreak of disease. J. Shellfish Res. 1(1): 83-87.

Available From:

National Oceanic and Atmospheric Administration, Environmental Data and Information Service, 6009 Executive Boulevard, Rockville, MD 20852

**73. Name:
Address:
Inquiries To:
Status:
User
Criteria:**

Farm Credit Administration
490 L'Enfant Plaza, S.W., Suite 4000, Washington DC 20578
George D. Irwin, Director, Economic Analysis Division
Federal
Determined by Farm Credit System banks and associations, within limits prescribed by Farm Credit Act of 1971

Aquaculture Staff: Irwin, George D.; Director, Economic Analysis Division
Aquaculture Programs: Credit/financing
Priority Services: Supervision of financial institutions which lend on commercial terms to businesses engaged in production of aquatic species under controlled conditions

74. **Name:** **United States Department of Agriculture, Animal and Plant Health Inspection Service**
 Address: 14th St. and Independence Avenue, Washington, DC 20250
Inquiries To: L.W. Schnurrenberger
 Status: Federal
User Obligation: Submit a formal request
 User
 Criteria: Individual case basis
Aquaculture Programs: Operation of a regulatory and reference laboratory
 Priority Services: Approval of biologics; reference and diagnostic laboratory, interstate and international potentially infectious disease control

75. **Name:** **Agricultural Marketing Service, U.S. Department of Agriculture**
 Address: 14th and Independence, S.W., Washington DC 20250
Inquiries To: Jim Toomey
 Status: Federal
User Obligation: Submit a formal request
 User
 Criteria: Requirements of the Agriculture Marketing Act of 1946 (7USC 1621-1627)
Aquaculture Staff: Toomey, Jim
Aquaculture Programs: Projects in marketing aquaculture products
 Priority Services: Services related to any aspect of marketing
 Goals: Assist in development of viable aquaculture industry
Information Available From: Mississippi State University, N.J. Department of Agriculture

76. **Name:** **Aquaculture Coordinator's Office, U.S. Department of Agriculture**
 Address: Washington, DC 20250; (202) 447-7223
Inquiries To: Bille Hougart, Aquaculture Coordinator
 Status: Federal
Aquaculture Staff: Hougart, Bille; USDA Aquaculture Coordinator; coordination of activities
 Priority Services: Department-wide coordination, policy development, industry liaison
 Goals: Development and maintenance of Departmental aquaculture programs

77. **Name:** **USDA, Farmers Home Administration, Farm Real Estate and Production Division**
 Address: 14th and Independence, S.W., Washington, DC 20250
 Inquiries To: Edward Yaxley, Jr.
 Status: Federal
User Obligation: Loan assistance
 User
 Criteria: Basic eligibility requirements as certified by county committees
 Aquaculture
 Programs: Credit/financing
 Priority
 Services: Provide funds for operating purposes, real estate improvement, refinancing
 Goals: Provide credit and management assistance necessary for farmers and ranchers to conduct successful operations
 Information
Available From: Extension Service
78. **Name:** **USDA, Economic Research Service**
 Address: Rm. 222 GHI Building, 500 12th Street, S.W., Washington, DC 20008; (202) 447-8636
 Inquiries To: Suzanne Dash, Agricultural Economist
 Status: Federal
 Aquaculture
 Staff: Dash, Suzanne; Aquaculture Analyst; monitors and analyzes supply, demand, and prices for the U.S. aquaculture industry with emphasis on fresh water species
 Aquaculture
 Programs: Economic analysis
 Priority
 Services: Publish outlook and situation reports; maintain economic data base for catfish and trout; analyze supply and demand conditions
 Publications: *Aquaculture Outlook and Situation.*
Available From: S. Dash, Rm. 222 GHI Building, 500 12th St., S.W., Wash., DC 20008
79. **Name:** **Statistical Reporting Service, U.S. Department of Agriculture**
 Address: Rm. 5867, South Agriculture Building, Washington, DC 20250
 Inquiries To: Paul Hurt, Head, Poultry Section
 Status: Federal
User Obligation: Submit a formal request; for published releases by subscription, \$1 per week
 Aquaculture
 Staff: Hurt, Paul; Poultry Section Head; analysis review
 Sitzman, Ron; Agricultural Statistician; supervises data collection and summarization
 Aquaculture
 Programs: Data collection on catfish processors
 Priority
 Services: Data collected in round weight purchased and price and amount processed and sold
 Goals: Collection of data relating to aquacultural production
 Publications: *Catfish Processors - Jan. 1982; Grower Survey - Inventory Jan. 1, 1982; Sales and Expenditures 1981 - Feb. 1982; Trout, Sept. 1, 1980 - Aug. 31, 1981; Sales Intentions, Expenditures, Oct. 1981; Aquaculture - Catfish and Trout - Inventory Feb. 1, 1981, Sales 1980 Summary, April 1981; Monthly publications of "Catfish," a report of catfish processed.*
Available From: SRS Publications, Rm. 5829 South Agriculture Building, Washington, DC 20250

80. **Name:** **Soil Conservation Service, U.S. Department of Agriculture**
 SCS biologists are in every state and are not listed here
 Address: P.O. Box 2890, Washington, DC 20013
 Inquiries To: Carl H. Thomas, National Biologist
 Status: Federal
 User:
 Criteria: By state
 Aquaculture
 Staff: Franzen, Robert W.; Northeast National Technical Center
 Biologist; 1974 Sproul Road, Eroomall, Pennsylvania, 19008,
 FTS 489-3222
 Hamilton, Rex; Midwest National Technical Center Biologist; 100
 Centennial Mall North, Federal Building, U.S. Courthouse,
 Room 393, Lincoln, Nebraska 68508, FTS 541-5357
 Marriage, L. Dean; West National Technical Center Biologist;
 511 NW Broadway, Federal Building, Portland, Oregon 97209,
 FTS 423-2841
 Smith, E. Ray, Jr.; South National Technical Center Biologist;
 P.O. Box 6567, Fort Worth, Texas 76115, FTS 334-5282
- Aquaculture**
 Programs: On-site technical assistance
 Priority
 Services: Resource inventory and appraisal, layout and design for
 construction of aquacultural facilities, water management and
 basic biological fish management
 Information
 Available From: State SCS offices
81. **Name:** **Shellfish Institute of North America**
 Type: Industry Trade Association
 Address: 1625 K Street, NW, Washington, DC 20006; (202) 659-5914
 Inquiries To: Candace Raynie, Director of Membership
 Key Staff/
 Members: Conley Jr., Weston F; Executive Vice President
 Lanier, R. Josh; Executive Director
 Lockwood, George; Co-chairman of Aquaculture Advisory Board
 Loring, Richard; Co-chairman of Aquaculture Advisory Board
 Pausina, Ralph V.; President
 Wendte, Ronald W.
- Services:** Technical/advisory, information, marketing (planned for 1983),
 representation of the industry in issues of policy formation
 Goals: Support aquaculture industry (aquaculture policy for the
 Shellfish Institute is being developed for 1983)
 Publications: *Annual Report*; Membership brochure.
- Aquaculture**
 Staff: Shellfish Institute of North America, 1625 K Street, NW,
 Washington, DC 20006
82. **Name:** **Sport Fishing Institute**
 Type: Recreational Fishing Association
 Address: 608 13th Street, N.W., Suite 801, Washington, DC 20005; (202)
 737-0668
 Inquiries To: Gilbert C. Radonski, Executive Vice President
 Key Staff/
 Members: Martin, Robert G.; Assistant Executive Vice President
 Prosser, Norville S.; Executive Secretary
 Radonski, Gilbert C.; Executive Vice President
- Services:** Information
 Goals: Optimization of aquacultural practices that will benefit
 recreational fishing opportunities in inland, freshwater, and
 coastal marine ecosystems
 Publications: *SFI Bulletin*.
- Available From:** 608 13th Street, N.W., Suite 801, Washington, DC 20005

FLORIDA

83. **Name:** U.S. Department of Commerce, NOAA, National Marine Fisheries Service, Southeast Fisheries Center
 Address: 75 Virginia Beach Drive, Miami, FL 33149
 Inquiries To: Dr. Edward F. Klima, Director, Galveston Laboratory, 4700 Avenue U, Galveston, Texas 77550
 Status: Federal
 User Obligation: Submit a formal request
 User:
 Criteria: Public information from ongoing research
 Aquaculture:
 Staff: Brown, Jr., Ausbon; Fishery Biologist; shrimp maturation
 Caillouet, Dr. Charles W.; Supervisory Fishery Biologist;
 Aquaculture Division Chief
 Costello, Tom; Fishery Administrator; public information,
 consultant on penaeid shrimp, *Macrobrachium*, and *Tilapia*
 Duronslet, Marcel; Fishery Biologist; physiology
 Fontaine, Tim; Fishery Biologist; shrimp and turtle culture
 Leong, Jorge; Microbiologist; pathology
 Marvin, Kenneth; Chemist; chemistry
 Mock, Cornelius; Fishery Biologist; shrimp and turtle culture
 Rivera, Dickie; Physical Scientist Technician; pathology
 Williams, Theodore; Fishery Biologist; shrimp maturation
 Zein-Eldin, Zoula; Chemist; physiology

 Aquaculture Programs: Research
 Priority:
 Services: Research on penaeid shrimp species and marine turtles;
 publication of research results
 Goals: Routine spawning of shrimp species, dietary requirements and
 physiology of shrimp species, culture of marine turtles
 Publications: Bibliography of publications.
 Available From: Dr. Edward F. Klima, Director, Galveston Laboratory, Southeast
 Fisheries Center, 4700 Avenue U, University of Galveston, TX
 77550
84. **Name:** Florida Tropical Fish Farms Association, Inc.
 Type: Producer Association
 Address: P.O. Box 1519, Winter Haven, FL 33880; (813) 293-5710
 Inquiries To: David Boozer, Executive Director
 Key Staff/
 Members: Atchison, Richard; Treasurer
 Boozer, David; Executive Director
 Groff, Howard; Secretary
 Hanan, John; Board of Directors
 Hennesy, Tim; Board of Directors
 Socolof, Ross; President
 Walker, Dave; 2nd Vice President
 Wetherington, Arlen; 1st Vice President
 Services: Research, technical/advisory, information, marketing,
 purchasing cooperative
 Goals: Aid in state policy formulation as it effects the aquaculture
 industry; promote and protect interests of the tropical fish
 industry in Florida; promotional publicity for tropical fish
 aquarium trade.
 Publications: *Some Interesting Facts About the Tropical Fish Industry in*
 Florida.
 Available From: Florida Tropical Fish Farms Association, P.O. Box 1519, Winter
 Haven, FL 33880

85. **Name:** **Florida Game and Fresh Water Fish Commission**
 Address: 620 South Meridian Street, Tallahassee, FL 32301
Inquiries To: Darrell L. Scovell, Section Leader, Commercial Fisheries
 Status: State
 Aquaculture
 Staff: Drda, Tom; Biologist Supervisor; Aquaculture Investigation Team
 Knox, Mike; Biologist; Aquaculture Investigation Team
Aquaculture
 Programs: Research, extension
 Priority
 Services: Provide on-site technical assistance to fish farmers (both food
 fish, game fish and ornamental fish culturists); pre-permit
 facility inspections for culture of exotic species; collect and
 distribute information applicable to aquaculture
 Goals: Document scope and status of aquaculture in Florida; research
 and development of appropriate guidelines for culture of
 nonnative fish to meet the Commission's regulatory
 responsibility; upgrade and continue to provide expertise in
 area of fish culture management.
Publications: *Florida Game and Fresh Water Fish Commission Aquaculture*
 Project 1980-81 Annual Report.
Available From: Florida Game and Fresh Water Fish Commission, 620 South
 Meridian Street, Tallahassee, FL 32301
86. **Name:** **Florida Department of Agriculture and Consumer Services,**
 Division of Plant Industry
 Address: Doyle Conner Building, P.O. Box 1629, Gainesville FL 32602
Inquiries To: Ralph King, Chief, Bureau of Plant Inspection
 Status: State
User Obligation: Pay a fee, submit a formal request, meet certification
 requirements
 User
 Criteria: Meet the certification required by the receiving state or
 county
Aquaculture
 Staff: Sixty-nine districts within the state; Agriculture Products
 Specialist III; certify plant material to meet the
 requirements of the receiving state or county
Aquaculture
 Programs: Regulatory
 Priority
 Services: Regulatory
87. **Name:** **Florida Department of Corrections, Hendry Correctional**
 Institution, Aquaculture Program
 Address: Hendry Correctional Institution, Rt. 2, Box 13A, Immokalee, FL
 33934; (813) 657-3654, Ext. 127
Inquiries To: Donald Crebs, Industries Production Supervisor
 Bruce French or Mike Ednoff, Consultants
 Status: State
Aquaculture
 Staff: Crebs, Donald; Industries Production Supervisor; Production
 Manager, stocking, harvesting processing, distribution
 Ednoff, Michael; Consultant; overall project administration,
 fish production, training
 Faehule, Patrick; Consultant; cage culture, water quality,
 training
 French, Bruce; Consultant Private (non-profit); systems design,
 culture techniques, diseases, hatchery, and training
 French, Scott; Industries Supervisor; administration of all
 industries programs at institution

Aquaculture Programs: Basic training program, vertically integrated catfish operation, tilapia production, cage culture

Priority Services: Training of unskilled persons (offenders), demonstration of fish culture systems

Goals: Maintain food production facility and fingerling supplies for statewide prison system; serve as a demonstration facility for the state; aquaculture research

Publications: *Final Report*; Bird Predation Information; Cage Culture Information; Water Quality Information.

88. **Name:** Florida Department of Natural Resources, Bureau of Aquatic Plant Research and Control

Address: Rm. 304, 3900 Commonwealth Boulevard, Tallahassee, FL 32303; (904) 488-5631

Inquiries To: Dennis M. Riley, Bureau Chief

Status: State

User Obligation: No obligation for extension, submit a formal request for permitting

User Criteria: Adhere to state rule on control and possession of aquatic plants

Aquaculture Staff: Maier, William; Biologist Supervisor II/Administrator Aquatic Plant Industry Section; regulates all importation, transportation, and culture of aquatic plants
Nall, Larry; Biologist Supervisor II/Administrator Research Section; funds, conducts, and monitors research activities relating to biology of aquatic plants and their control, including culture of biological controls
Schardt, Jeff; Biologist Supervisor II/Field Operations and Permitting Section; regulates control of aquatic plants, provides extension services regarding methods of aquatic plant control

Aquaculture Programs: Research, extension, permitting

Priority Services: Permitting of aquatic plant control activities; permitting of importation, transportation, or cultivation of aquatic plants; extension services for proper aquatic plant control methods

Goals: Prevent escape and establishment of non-native cultured aquatic plants into natural waters; promote safe and effective, necessary aquatic plant control

Publications: *Aquatic and Wetland Plants of Florida*, 1979.

Available From: Bureau of Aquatic Plant Research and Control, 3900 Commonwealth Blvd., Tallahassee, Florida 32303

89. **Name:** Florida Department of Natural Resources, Marine Research Laboratory

Address: 100 8th Ave, SE, St. Petersburg, FL 33701

Inquiries To: Daniel E. Roberts, Jr., Biologist Supervisor, Experimental Culture and Physiology

Status: State, Cooperative

Aquaculture Staff: Burns, Cary; Biologist; aquatic animal pathology
HalScott, Kenneth; Biologist; finfish conditioning/spawning, larval rearing and computer operation
Havens, Walt; Technician; feeding and systems maintenance
Huff, Alan; Senior Biologist; marine turtles
Plaia, William; Biologist; larval rearing and electronic instrumentation

Reese, Ruth; Biologist/Histologist; electron microscopist
 Roberts, Daniel; Biologist Supervisor of Experimental
 Culture/Physiology Section; physiology
 Schlieder, Rod; Biologist Supervisor; finfish
 conditioning/spawning, closed systems design
 Serino, Jamie; Marine Science Tech II; phytoplankton and
 zooplankton
 Willis, Scott; Biologist Supervisor; finfish cultural food
 dynamics and production, invertebrate experimental culture

Aquaculture
Programs: Research
Priority
Services: Publication of scientific research
Goals: Comprehensive understanding of reproductive physiology of
 marine finfishes, trophic dynamics of larval marine finfishes
Information
Available From: Mary Krost, Librarian, MRL, 100 8th Ave., SE, St. Petersburg,
 FL 33701

GEORGIA

90. **Name:** Smoky Mountain Trout Growers Association
Type: Information Association
Address: Box 183, Suches, GA 30572
Inquiries To: Chuck Zimmerman, President
Key Staff/
Members: Bramlett, Terry; Secretary
 Zimmerman, Chuck; President
Services: Research, information
Goals: Provide information to trout growers
Publications: Southern Appalachian Trout Growers Association, Inc.,
 Membership Brochure
Available From: P.O. Box 425, Candler, North Carolina 28215

91. **Name:** Georgia Department of Natural Resources, Game and Fish
 Division, Fisheries Section
Address: 270 Washington Street, S.W., Room 709, Atlanta, GA 30334
Inquiries To: Richard M. Gennings, Chief of Fisheries
Status: State
User
Criteria: Resident of Georgia
Aquaculture
Staff: Gennings, Richard M.; Chief of Fisheries; referral of fish
 disease and fish management inquiries
Aquaculture
Programs: Extension
Priority
Services: Consultation on fish management, contact for disease diagnosis
Goals: Provide consultation on fish management and serve as a contact
 for fish disease diagnosis for any aquacultural operation
 requesting our assistance

GUAM

92. **Name:** Guam Aquaculture Association
Type: Producer Association
Address: Box 6284, Inarajan, GU 96916
Inquiries To: David-Martin Giusti, President
Key Staff/
Members: Baza, Jose; Secretary/Treasurer
 Crisostomo, David; Vice President

Services: Giusti, David-Martin; President
 Technical/advisory, information, marketing
Publications: Guam Aquaculture Association Articles of Incorporation, and Bylaws.
Available From: Guam Aquaculture, Box 6284, Inarajan, GU 96916

93. **Name:** **Guam Farmers Cooperative Association**
Type: Cooperative
Address: P.O. Box 3081, Agana, GU 96910
Inquiries To: Felix P. Quan, General Manager, Farmers Cooperative Association
Key Staff/
Members: Guerrero, Fred Leon; Dean CALS, University of Guam
Services: Obtain larvae for members, make available shrimp and fish feeds
Goals: Make Guam self-sustaining in shrimp and fish production

94. **Name:** **Aquatic and Wildlife Resources**
Address: P.O. Box 23367, GMF, GU 96921
Inquiries To: Harry T. Kami, Chief
Status: State
Aquaculture
Staff: Kruckenberg, Wayne; Fishery Biologist II; Project Leader
 Aquaculture Project
Aquaculture
Programs: Research
Goals: Short term - to artificially spawn the Asian catfish *Pangasius sutchi* for pond culture; Long term - to provide suitable organisms for pond culture, thus enabling local pond operators to culture multiple species in their ponds
Publications: *Annual Division Reports.*
Available From: Aquatic and Wildlife Resources, P.O. Box 23367, GMF, Guam 96921

95. **Name:** **Department of Commerce**
Address: P.O. Box 682, Agana, GU 96910
Inquiries To: William J. FitzGerald; Aquaculture Specialist
Status: Territorial Government
Aquaculture
Staff: FitzGerald, William J.; Aquaculture Specialist/Acting Chief
 Division of Economic Development and Planning; aquaculture industry development
Aquaculture
Programs: Economic development
Priority
Services: Consultation; technical evaluation and advice; economic development, planning, and promotion of an aquaculture industry
Goals: Short term - construction of a permanent on-island hatchery (*Macrobrachium rosenbergii*, 8x10x6 post larvae/year); Long-term - aquaculture loan program (\$1.2 million), development of an industry to supplant imports and produce a product for export
Publications: Bibliography.
Available From: Department of Commerce, P.O. Box 682, Agana, Guam 96910

HAWAII

96. **Name:** **Hawaii Prawn Producers Association**
 Type: Producer Association
 Address: 335 Merchant Street, Room 359, Honolulu, HI 96813
 Inquiries To: Kendrick Lee, Economist/Analyst, Aquaculture Development Program
 Key Staff/
 Members: Kido, Roy; Secretary/Treasurer
 Rietow, Allan; President
 Smith, C. Bruce; Vice-President
 Wallace, Jeffrey; Vice-President
 Services: Technical/advisory, information
 Goals: Assist in the development, growth, marketing, and promotion of Hawaiian prawns; encourage that prawns be of high quality and establish appropriate standards thereof; encourage ethical standards of business conduct among member growers and processors of prawns in Hawaii; seek aid of governmental agencies in promoting the increased sale, promotion, and distribution of prawns grown or processed in Hawaii for local, mainland, and export markets; gather, compile, and disseminate general, technical, and economic information of interest to growers and processors of Hawaiian prawns
97. **Name:** **Aquaculture Development Program**
 Address: State Department of Land and Natural Resources, 335 Merchant Street, Room 359, Honolulu, HI 96813
 Inquiries To: John S. Corbin, Manager
 Status: State
 User Obligation: Submit a formal request
 User
 Criteria: State of Hawaii resident; for out-of-state and international inquiries, potential benefit to Hawaii must be recognizable. Other public agencies, U.S. or foreign, are generally provided assistance.
- Aquaculture**
 Staff: Au, Theresa; Clerk/Typist; clerical support
 Brewer, William; Aquaculture Specialist; research administration, permit counseling and technical support
 Brock, James; Disease Specialist, DVM; disease diagnosis, prevention services, species importation review
 Corbin, John; Manager; overall program responsibility, planning, program implementation
 Fassler, Richard; Information Specialist; general aquaculture information, species and site counseling
 Lee, Kendrick; Economist/Analyst; aquaculture economics and marketing assistance
 Nakagawa, Lauren; Medical Technologist; Asst. Disease Specialist
 Quezon, Jenny; Office Manager; office management
 Sexton, Jane; Information Specialist; general aquaculture information, contracts monitoring, legislative and congressional liaison
 Shimojo, Ron; Laboratory Technician; Asst. Disease Specialist
- Aquaculture**
 Programs: Research (funding), extension, statewide planning, commercial development and support services.
- Priority**
 Services: Species and site location counseling, permit counseling and assistance, disease diagnosis and prevention services

Goals: State goal - realization of commercial aquaculture production as a major economic activity, and establishment of the state as a national and international center of aquaculture expertise; Short Term - \$32 million/year industry by 1985; Long Term - \$300 million/year industry by 2000

Publications: *Aquaculture In Hawaii Information Bulletin; Freshwater Prawn Production in Hawaii; Practices and Economics; Ocean Leasing for Hawaii; Permits and Environmental Requirements for Aquaculture in Hawaii.*

Available From: Aquaculture Development Program, 335 Merchant Street, Rm. 359, Honolulu, Hawaii 96813

98. **Name:** Department of Agriculture, Aquaculture Loan Program

Address: 1428 South King Street, Honolulu, HI 96814

Inquiries To: Richard T. Morimoto, Agriculture Loan Division Head

Status: State

User Obligation: Interest on loans

User:

Criteria: Aquaculturists

Aquaculture Staff: Ikeno, Robert; Agricultural Loan Rep. II
Morimoto, Richard T; Project Administrator; Agricultural Loan Division
Nakamoto, Toshio; Agricultural Loan Rep. III
Sako, Seiichi; Agricultural Loan Rep. II
Sievers, Richard; Agricultural Loan Rep. II
Uemoto, Robert; Agricultural Loan Rep. II
Yatogo, Koji; Agricultural Loan Rep. III

Aquaculture Programs: Credit/financing

Priority:

Services: Loan processing, servicing loan accounts, data collection

Goals: Develop aquaculture potential to improve state's economic base

IDAHO

99. **Name:** Department of Interior, U.S. Fish and Wildlife Service, Tunison Laboratory of Fish Nutrition

Address: Route 1, Box 256-1, Hagerman, ID 83332

Inquiries To: Dr. Robert R. Smith, Research Physiologist

Status: Federal

Aquaculture Staff: Smith, Dr. Robert R.; Research Physiologist; fish nutrition research

Aquaculture Programs: Research

Priority:

Services: Evaluate potential diet ingredients on basis of digestibility and metabolizable energy; provide data on nutrient requirements of fish to producers and feed manufacturers

Goals: Long Term - identify and quantitate nutrient requirements of fish and identify diet ingredients which will fill those requirements for maximum efficiency in fish production; Short Term - anticipate market conditions and have evaluation data on new or unproven materials when presently used ingredients are no longer available

Publications: Bibliography of research publications.

Available From: Tunison Laboratory of Fish Nutrition, Route 1, Box 256-1, Hagerman, Idaho 83332

IOWA

100. **Name:** **Iowa Cooperative Fishery Research Unit**
 Address: 11 Science Hall II, Iowa State University, Ames, IA 50011;
 (515) 294-3057
 Inquiries To: Dr. John G. Nickum, Leader
 Status: Cooperative
 User Obligation: Submit a formal request; any data developed must be available
 for research purposes
 User
 Criteria: Services to be rendered must be consistent with the goals of
 our research, teaching, technical assistance programs
 Aquaculture
 Staff: Nickum, John G.; Leader; research, teaching, and research
 administration
 Aquaculture
 Programs: Research, formal education
 Priority
 Services: Research on applied and basic aquacultural problems,
 professional training, both long term and short term, technical
 assistance with problems in aquaculture development or
 operations
 Goals: Development of rearing systems and diets for the intensive
 culture of walleyes; testing of alternate systems for handling
 and incubating catfish eggs; improvement of systems for using
 surface waters and/or wastewaters for intensive aquaculture
 Publications: *Positive Phototaxis During Initial Feeding Stages of Walleye*
 Larvae, In: *Rapp. P-V. Reun. Cons. Int. Explor. Mar.* 178,
 492-494, 1981; *Riboflavin Requirement of Fingerling Rainbow*
 Trout, *Progressive Fish Culturist* 43 (4), 167-172.; *Intensive*
 Culture of Walleyes, *The State of the Art*, pp. 187-194. In:
 Selected Coolwater Fishes of North America. *Am. Fish. Soc.*
 Spec. Publ. 11.
 Available From: John G. Nickum, Leader Iowa CFRU, Science Hall II, I.S.U.,
 Ames, Iowa

KANSAS

101. **Name:** **Kansas Commercial Fish Growers Association**
 Type: Producer Association
 Address: P.O. Box 1, Kingman, KS 67068; (316) 532-2013
 Inquiries To: Robert S. Clark, Secretary/Treasurer, Rt. 1, Kingman, Kansas
 67068
 Key Staff/
 Members: Bruch, Gary; Director
 Clark, Robert S.; Secretary/Treasurer
 Corbin, Sidney; Director
 Culver, Brent; Director
 Hallock, John G.; President
 Hartley, W.E.; Consultant
 Hudson, Stan; Director
 Hudson, Tom G.; Vice President (President-Elect)
 Klaassen, Harold; Director
 Krehbiel, Vernon E.; Consultant
 Weidner, Del; Director
 Services: Technical/advisory, information, solidarity
 Goals: Provide cohesiveness and political backing on key issues;
 provide strength through unity; provide technical expertise to
 newcomers in the fish farming arena

102. **Name:** **State of Kansas Fish and Game Commission**
 Address: Rt. 2 Box 54A, Pratt KS 67124
 Inquiries To: Verl Stevens, Supervisor Fish Culture Section
 Status: State
User Obligation: Submit a formal request
 Aquaculture
 Staff: Lillie, Joe; Hatchery Manager
 Mense, Steve; Hatchery Manager
 Patton, Don; Hatchery Manager
 Stevens, Verl; Supervisor, Fish Culture Section; coordinates
 overall fish production program

 Aquaculture
 Programs: Production
 Priority
 Services: Fish culture recommendations; fish disease diagnosis; aquatic
 vegetation control
 Goals: Evaluate and accelerate production of warmwater fish

KENTUCKY

103. **Name:** **Kentucky Department of Fish and Wildlife Resources, Division of Fisheries**
 Address: One Game Farm Road, Frankfort, KY 40601; (502) 564-3596
 Inquiries To: Ted Crowell
 Status: State
User Obligation: Submit a formal request
 Aquaculture
 Staff: Seven district biologists; technical guidance
 Aquaculture
 Programs: Extension

LOUISIANA

104. **Name:** **Louisiana Cooperative Fishery Research Unit**
 Address: Rm. 247, Ag Center, Louisiana State University, Baton Rouge, LA
 70803; (504) 388-6051
 Inquiries To: Dr. C. F. Bryan, Leader and Professor Adjunct
 Status: Federal
User Obligation: Depends on amount of time required
 Aquaculture
 Staff: Bryan, Charles; Leader and Adjunct Professor
 Aquaculture
 Programs: Research, formal education, extension
 Priority
 Services: Teaching general pond limnology, research dealing with water
 quality, life history requirements, suitable organisms for
 geographic location
 Goals: Provide information on the cultured species and their
 environmental requirements

105. **Name:** **International Association of Astacology**
 Type: International Organization for Scientific Study of Crayfish
 Address: James W. Avault, School of Forestry and Wildlife Management,
 Louisiana State University, Baton Rouge, LA 70803
 Inquiries To: A. Stellan Carlsson, President
 Key Staff/
 Members: Avault, James W.
 Carlsson, A. Stellan; President
 Goldman, Charles R.
 Payne, James; Newsletter Editor, Secretary/Treasurer

Services: Technical/advisory, information, annual international congress and publication of symposium papers
Goals: Encourage the scientific study of crayfish for the benefit of all mankind, provide information of research on crayfish, develop a forum for international discussion of topics dealing with crayfish.
Publications: *I.A.A. News Letter*.
Available From: James Payne, I.A.A., Department of Biology, Memphis State University, Memphis, TN 38152

106. **Name:** Louisiana Crawfish Farmers Association
Type: Producer Association
Address: P.O. Box 91544, Lafayette, LA 70509
Inquiries To: Jerry Wood, President
Key Staff/
Members: Cremer, Louis; Secretary
 Falgout, Ted; Treasurer
 Wood, Gerald; President
Services: Information, marketing (direct interested persons to a source of crawfish), representation at hearings which consider legislative policy of importance to crawfish producers
Goals: Disseminate information through newsletters and meetings
Publications: *Crawfish Tails*; Membership form (includes a description of activities).
Available From: Louisiana Crawfish Farmers Association, P.O. Box 91544, Lafayette, LA 70509

107. **Name:** Louisiana Department of Wildlife and Fisheries
Address: P.O. Box 14526, SE Station, Baton Rouge, LA 70898
Inquiries To: Jesse J. Guidry, Secretary
Status: State
Aquaculture
Staff: Chatry, Mark; Biologist; shrimp, oyster, clam
 Cole, Benjamin; Marine Technician; shrimp culture
 Hughes, Janice; Biologist; culture of striped bass
 Perry, W. Guthrie; Biologist; brackish water pond culture of estuarine species
 Stokes, Sammy; Biologist; culture of fresh water fish
 Tilyou, Gary; Biologist; culture of crawfish
Aquaculture
Programs: Research, extension
Priority
Services: Research as it pertains to the commercially important marine species, shrimp and oyster culture, technical assistance to owners of farm ponds and small lakes to increase man-day recreations
Goals: Encourage aquaculture as a means of keeping our wetlands as wetlands and not drained and turned into areas void of wildlife; bring new industry to Louisiana
Publications: *Growth and Survival of Macrobrachium rosenbergii in Brackish Water (10-20 ppt) Ponds*, *Proceedings World Mariculture Society*; *Managing Louisiana Fish Ponds*, *Fish Division Bulletin No. 4*; *Crawfish Farming*, *Fish Division Bulletin No. 7*; *Channel Catfish Farming in Louisiana*, *Fish Division Bulletin No. 98*; *Striped Bass, Morone saxatilis (Walbaum)*, *Culture Investigations in Louisiana With Notes on Sensitivity of Fry and Fingerlings to Various Chemicals*, *Fish Division Bulletin No. 13*; *The Basics of Breeding and Fingerling Production of Channel Catfish*, *Fish Division Bulletin No. 117*.
Available From: Louisiana Department of Wildlife and Fisheries, P.O. Box 14526, SE Station, Baton Rouge, LA 70898

108. **Name:** **World Mariculture Society**
 Type: Membership Society
 Address: 177 Pleasant Hall, Division of Continuing Education, Louisiana
 State University, Baton Rouge, LA 70803; (504) 388-3162
Inquiries To: World Mariculture Society, Home Office
 Key Staff/
 Members: Conte, Fred S.; President Elect
 Johnson, Ken; Secretary
 Lockwood, George S.; President
 Meyers, Samuel P.; Treasurer
 Perry, Guthrie; Past President
 Pruder, Gary; Vice President
Services: Research, information, annual convention
 Goals: Bring together scientists, fish farmers, and businessmen to
 promote mutual edification; promote and evaluate the
 educational, scientific, and technological developments and
 advances of mariculture throughout the world.
Publications: *Quarterly Newsletter; Journal of World Mariculture Society.*
Available From: World Mariculture Society, Pleasant Hall, Division of
 Continuing Education, Louisiana State University, Baton Rouge,
 LA 70803

MAINE

109. **Name:** **Maine Cooperative Fishery Research Unit**
 Address: Department of Zoology, University of Maine, Orono, ME 04469;
 (207) 581-7151
Inquiries To: Jon G. Stanley, Leader; John R. Moring, Assistant Leader
 Status: Cooperative
 Aquaculture
 Staff: Allen, Standish K.; Research Associate; genetics and
 aquaculture
 Moring, John R.; Assistant Leader; research on aquaculture
 Stanley, Jon G.; Leader; research on genetics in aquaculture
Aquaculture
 Programs: Research, extension
 Priority
 Services: Provide information on aquaculture to public; work with fish
 farmers on genetics of brood stock; cooperate with smelt
 culturists
Publications: *Manipulation of Developmental Events To Produce Monosex and*
 Sterile Fish; Polyploidy Induced in the American Oyster,
 Crassostrea virginica, With Cytochalasin B.
Available From: Maine Cooperative Fishery Unit, Dept. of Zoology, Univ. of
 Maine, Orono, ME 04469

MARYLAND

110. **Name:** **American Fisheries Society**
 Type: Scientific
 Address: 5410 Grosvenor Lane, Bethesda, MD 20014; (301) 897-8616
Inquiries To: Jack Millard, Secretary, AFS Fish Culture Section
 Key Staff/
 Members: Hood, Shyrll; Past President, FCS
 Hughes, Janice; Past President, FCS, 1st Vice President, AFS
 Lewis, William; President Elect AFS
 Magnuson, John J.; AFS President
 Millard, Jack; Secretary, AFS Fish Culture Section
 Parker, Nick; President, AFS Fish Culture Section
 Piper, Robert G.; President, Fish Culture Section
 Suppes, Charles; Vice President, AFS Fish Culture Section
 Whitacre, Maurice; Treasurer, AFS Fish Culture Section

- Services:** Research, technical/advisory, information
Goals: Establish and maintain an association of individuals interested in advancing the science and technology of fish culture through conducting and promoting scientific research, workshops, and projects, and collecting and assembling fish cultural information for publication and distribution to Section and Society members, the general public, and to private and public institutions; develop criteria aimed at establishing levels of expertise among fish culturists; reestablish and maintain a registry of qualified fish culturists for providing specific fish cultural technology expertise upon the request of individuals or organizations
Publications: *Fisheries; Transactions of the American Fisheries Society; North American Journal of Fisheries Management; A Century of Fisheries in North America.*
Available From: American Fisheries Society, 5410 Grosvenor Lane, Suite 110, Bethesda, MD 20814
- 111. Name:** **Cooperative Shellfish Research and Technology Unit**
Address: Box 351, Crisfield, MD 21817; (301) 968-1655 Alternate address, Horn Point Environmental Labs, Cambridge, MD 21613
Inquiries To: George E. Krantz, Associate Professor; Donald M. Webster, Marine Extension Specialist
Status: Cooperative (University of Maryland and State Dept. of Natural Resources)
User Obligation: Submit a formal request
Aquaculture
Staff: Baptist, Gary E.; Algologist; mass culture of algae, hatchery operation
Cockey, Ralph; Microbiologist; water and seafood quality
Davis, Harold E.; Biologist; oyster culture, lease operation
Krantz, George E.; Associate Professor; oyster culture, hatchery operations, lease operation
Meritt, Donald E.; Biologist; oyster culture, hatchery operations, lease operation
Paperella, Michael; Seafood Extension Specialist; seafood processing
Seiling, William; Extension Specialist; general extension, legislative liaison
Webster, Donald M.; Marine Extension Specialist; business operation, loans, mechanical equipment
Aquaculture
Programs: Research, formal education, extension
Priority
Services: Oyster culture and hatching operation; technical and economic assistance to private aquaculture venture; seafood industry extension (multiple species)
Goals: Enhance oyster production in Maryland's public and private sectors; introduce low-cost seed hatchery technology and modern systems to Maryland's shellfish industry (oysters, hard clams, soft clams)
Publications: See Maryland Sea Grant Lists; Maryland Aquaculture Conferences 1979, 1980, 1981.
Available From: University of Maryland Cooperative Extension Service, College Park, MD 20742
- 112. Name:** **Maryland Department of Natural Resources, Tidewater Administration, Tidal Fisheries**
Address: Tawes State Office Building, Annapolis, MD 21401
Inquiries To: F. William Sieling III, Natural Resources Manager
Status: State

Aquaculture Staff: Boone, Joe; Anadromist, Estuarine Division
Dintamen, Ray; Crab Management
Florence, Ben; Fisheries Technology Advisory Services
Krantz, George; Director of Cooperative Shellfish Agriculture and Technology Laboratory
Ottien, Bill; Shellfish Program Leader
Scott, Roy; Clam Management
Stelling III, William F.; Natural Resources Manager
Webster, Don; Fisheries Extension Agent

Aquaculture Programs: Research, formal education, extension, sponsor conferences, vocational training

Priority Services: Operate and demonstrate oyster hatchery and research laboratory in cooperation with the University of Maryland, publish articles and publications on our research and programs for use by the seafood industry in Maryland, sponsor an Aquaculture Conference every year for those interested in aquaculture businesses and hold smaller meetings to help groups when needed

Goals: Short Term - make people in Maryland aware of the potential of aquaculture and help them whenever possible to get started in business, make the same benefit and subsidies available to the aquaculturist as are presently available to farmers, expand our aquaculture research and demonstrations capabilities to help interested people get the needed scientific knowledge and the practical experience to be successful aquaculturists; Long Term - make aquaculture a strong enough component of our seafood industry so that Maryland can compete on even terms with the other food producers in the United States who can guarantee a dependable, steady supply of food to the consumer at a reasonable price, provide an additional source of revenue to the citizens of Maryland through the use of aquaculture, and benefit the economy of the state

Publications: *Tidewater Fisheries News; Oyster Culture Conference proceedings 1978-1979; University of Maryland Crisfield Laboratory Seafood Tips.*

Available From: Department of Natural Resources, University of Maryland Sea Grant and Co-Operative Shellfish Research Laboratory - Crisfield

MASSACHUSETTS

113. **Name:** Massachusetts Cooperative Fishery Research Unit
Address: 204 Holdsworth Hall, University of Massachusetts, Amherst, MA 01003

Inquiries To: Dr. Henry E. Boone, Unit Leader
Status: Federal
User Obligation: Submit a formal request
User Criteria: State of Massachusetts

Aquaculture Staff: Boone, Dr. H.E.; Coop. Unit Leader; consultation and fish genetics research

Aquaculture Programs: Research, extension

Priority Services: Selective breeding, fish stock analysis using biochemical characters, consultation service on ponds.

Goals: Fish stock analysis by genetic study, Atlantic salmon selective breeding plan for N.E. Federal hatcheries

MICHIGAN

114. **Name:** **Michigan Cooperative Extension Service**
 Address: Michigan State University, East Lansing, MI 48824; (517)
 355-7494
 Inquiries To: Dr. Donald L. Garling
 Status: Cooperative
 Aquaculture
 Staff: Garling, Donald L.; Fish Culture Extension Specialist;
 extension programming
 Aquaculture
 Programs: Research, formal education, extension
 Priority
 Services: Extension programming, question and referral to aquacultural
 industry and interested state and private individuals, formal
 education and research
 Goals: Establish statewide realistic expectations for fish culture and
 bait production; assist established fish culturists in
 production and economic planning; identify Michigan bait
 producers and the potential for expansion of production in
 Michigan; assist potential fish culturists and bait producers
 in planning for commercial operations by their understanding of
 economic and biological and legal requirements
 Publications: *Planning for Commercial Fish Culture in the Great Lakes Region*
 and *Fee-fishing Pond Management*; *Profiles of Aquaculture in*
 Michigan; additional publications are available in pond
 management, weed control, and other subjects.
 Available From: Donald L. Garling, Fish Culture Extension Specialist, Dept. of
 Fisheries and Wildlife, 13 Natural Resources Bldg., MSU, East
 Lansing, MI 48824

MINNESOTA

115. **Name:** **Central Minnesota Fish Farmers Association**
 Type: Producer Association
 Address: Rt. 1, Buffalo, MN 55313
 Inquiries To: George Lukach, President
 Key Staff/
 Members: Collins, Dennis; Secretary/Treasurer
 Lukach, George; President
 Painschab, Leonard; Vice-President
 Rademacher, Ron; Director
 Simon, Frank; Director
 Services: Research, technical/advisory, information, newsletter,
 cooperative use of fish farming equipment
 Goals: Promote and sustain fish farming in central Minnesota
 Publications: *The Catch Newsletter*.
 Available From: Gloria Olson, Editor, 1016 Richmond Ct., St. Paul, MN 55112
116. **Name:** **Minnesota Cooperative Extension Service**
 Address: Department of Entomology, Fisheries, and Wildlife, University
 of Minnesota, St. Paul, MN 55108
 Inquiries To: Douglas Tave
 Status: Cooperative
 User Obligation: None except for detailed work requiring a consultant
 Aquaculture
 Staff: Tave, Douglas; Assistant Professor and Aquacultural Extension
 Specialist; teaching, research, extension

Aquaculture

Programs: Research, formal education, extension
Priority
Services: Extension, research, teaching
Goals: Develop program for bait fish production in Minnesota; genetic engineering of food fish

117. **Name:** Minnesota Department of Agriculture
Address: 90 West Plato Boulevard, St. Paul, MN 55107; (612) 296-9310
Inquiries To: Mark W. Seetin, Commissioner
Status: State

User Obligation: Pay a fee; maintain Federal-state processing and quality standards required for licensing, inspection

User
Criteria: Commodity - commercial fish processing and smoking; approved sanitary housing and processing equipment

Aquaculture

Staff: Masso, Thomas; Director, Food, Meat, and Poultry Inspection Division; licensing and inspection of commercial processing packaging and marketing facilities
Powlowski, Henry; International Trade Specialist; export market development for Minnesota food and agricultural products
Tretsven, Richard; Marketing Specialist; domestic market development for Minnesota food and agricultural products

Aquaculture

Programs: Regulation of commercial processing; market development
Priority
Services: Licensing commercial processors, inspection of commercial processing, marketing of Minnesota processed fish products
Goals: Assure consumer quality and acceptance of fish products, promote new and expanded markets for these products, thereby encouraging increased production, increased employment, increasing contributions to the health of our state's economy

MISSISSIPPI

118. **Name:** American Catfish Marketing Association
Type: Marketing Association
Address: P.O. Box 1609, Jackson, MS 39205; (601) 948-5938
Inquiries To: Dorothy P. Woods; Acting Executive Secretary

Key Staff/
Members: Dauler, Bill; Secretary/Treasurer
Joiner, Larry; President
Tallant, John; Vice President
Goals: Promote and develop markets for processed farm-raised catfish; promote and develop the art of processing domestic farm-raised catfish; promote and develop producer organizations for furtherance of the supply of quality domestic farm-raised catfish.

119. **Name:** Catfish Farmers of America
Type: Producer Association
Address: P.O. Box 34, Jackson, MS 39205; (601) 353-7916
Inquiries To: Mark D. Freeman, Executive Vice President

Key Staff/
Members: Eaves, John; Secretary
Edwards, W.S.; Treasurer
Freeman, Mark D.; Executive Vice President
Johnson, Seymour; Congressional Liaison
Meyers, Lester; President

Services: Research, technical/advisory, information, marketing
Goals: Promote the general welfare of the farm-raised catfish industry
Publications: Packet of information--various inclusions; recipes.
Available From: P.O. Box 34, Jackson, Mississippi 39205

120. Name: Catfish Farmers of Mississippi
Type: Producer Association
Address: P.O. Box 1609, Jackson, MS 39205; (601) 948-5938
Inquiries To: Dorothy Woods, Mississippi Department of Agriculture and Commerce
Key Staff/
Members: Arant, Turner; President Elect
 McCarty, A.B.; President
 Peaster, Tommy; Secretary
Goals: Promote the general welfare of the farm-raised catfish industry

121. Name: Mississippi Cooperative Extension Service
Address: Delta Branch Experiment Station, Stoneville, MS 38776
Inquiries To: Thomas E. Schwelder, Area Wildlife and Fisheries Specialist
Status: Cooperative
User
Criteria: Twenty-one counties of Mississippi delta
Aquaculture
Staff: MacMillan, Dr. J.R.; Area Extension Fisheries Specialist; provides leadership for the aquaculture industry in Mississippi
 Santocci, Mr. Tim; Lab Technician; assists in fish disease diagnosis
 Schwedler, Dr. Tom; Area Fish Specialist; fish disease diagnosis, aquaculture extension, teaching program
 Wellborn, Dr. Tom; Leader-Extension Wildlife and Fisheries Department; Program-Development Administrator, fish disease diagnosis, aquaculture extension
Aquaculture
Programs: Research, extension
Priority
Services: Training producers, diagnostic services, technical assistance
Goals: Assist producers in becoming cost effective in aquaculture-related activities; develop and extend technology
Information
Available From: Dr. Tom Wellborn, Wildlife and Fisheries Department, Mississippi Coop. Extension Service, Mississippi State University

122. Name: Mississippi Department of Agriculture and Commerce
Address: P.O. Box 1609, 550 High Street, Jackson, MS 39205; (601) 354-6563
Inquiries To: Mark D. Freeman, Jr., Director of Regulatory Services
Status: Cooperative
Aquaculture
Staff: Freeman, Jr., Mark D.; Director of Regulatory Services
Aquaculture
Programs: General enhancement of farm raised catfish industry
Goals: Assist in the development of a profitable farm raised catfish industry
Information
Available From: Mark D. Freeman, Jr., P.O. Box 1609, Jackson, MS 39205--phone (601) 354-6569

123. **Name:** **Mississippi Catfish Farmers Marketing Association**
 Type: Producer Association, Marketing Association, Cooperative
 Address: P.O. Box 230, Indianola, MS 38751
 Inquiries To: Paul Barnett, Executive Director; John T. Dillard, President
 Key Staff/
 Members: Barrett, Paul; Executive Director
 Dillard, John T.; President
 Myers, Lester; Vice President
 Watson, Granville; Secretary
 Services: Marketing
 Goals: Obtain fair market prices for farm-raised catfish
124. **Name:** **Mississippi Farm Bureau Federation, Catfish Commodity Division**
 Type: Farm Bureau
 Address: P.O. Box 1972, Jackson MS 39205
 Inquiries To: E.H. Tucker, Associate Commodity Director
 Key Staff/
 Members: Arant, Turner; Chairman, Catfish Commodity Division and
 Chairman of American Farm Bureau Aquaculture Division
 Services: Research on current laws and possible new legislation,
 technical/advisory, information, marketing, policy
 recommendation to the counties and State Resolutions Committee.
 Goals: Furnish means for catfish policy development by producers and
 assist in policy execution
 Catfish Report.
 Publications: E.H. Tucker, Associate Commodity Director, Mississippi Farm
 Available From: Bureau Federation, P.O. Box 1972, Jackson, MS 39205
125. **Name:** **Mississippi Department of Wildlife Conservation, Bureau of**
 Marine Resources
 Address: P.O. Drawer 959, Long Beach, MS 39560; (601) 864-4602
 Inquiries To: Dr. Cornell M. Ladner
 Status: State
 Aquaculture
 Staff: Ladner, Dr. Cornell M.; Chief, Scientific-Statistical Division
 of the Bureau of Marine Resources; aquaculture development
 and enhancement in the coastal area of Mississippi
 Leard, Dr. Richard L.; Director, Bureau of Marine Resources;
 aquaculture development and enhancement in the coastal area
 of Mississippi
 Aquaculture
 Programs: Scientific-technical advice
 Priority
 Services: Provide technical advisory assistance to existing aquaculture
 operations and encourage the development and enhancement of new
 intensive aquaculture operations in the coastal area of
 Mississippi; contribute funds to research projects aimed at
 providing information to aid in the development of intensive
 aquaculture, particularly in the coastal area of Mississippi
 Goals: Provide technical assistance to enhance existing aquaculture
 operations in the coastal area of Mississippi; maintain an
 awareness of new developments in aquaculture to encourage and
 assist in the development of new intensive aquaculture
 operations in the coastal area of Mississippi and, through
 continuing technical assistance, aid in maintaining these
 operations as viable and productive businesses
 Publications: A list of publications for general distribution will be
 available during early 1983.
 Available From: Mississippi Bureau of Marine Resources, P.O. Drawer 959, Long
 Beach, Mississippi 39560

126. **Name:** **Mississippi Department of Natural Resources, Bureau of Land and Water Resources**
 Address: P.O. Box 10631, Jackson, MS 39209
Inquiries To: Charles T. Branch, Director, Bureau of Land and Water Resources
 Status: State
 Aquaculture
 Staff: Winters, Darrell; Engineer; groundwater resources assessments
 Aquaculture
 Programs: Water resource data bank
 Priority
 Services: Provide information to aquacultural farmers on resource availability
 Goals: Short Term - assess effects on shallow water tables in Mississippi Delta; Long Term - predict capability of Delta alluvium aquifer to support catfish production on sustained basis
 Publications: Water-level map of the Mississippi Delta alluvium in Northwestern Mississippi, Sept., 1980; water-level map of the Mississippi Delta alluvium in Northwestern Mississippi, April, 1981.
Available From: Mississippi Department of Natural Resources, Bureau of Land and Water Resources, P.O. Box 10631, Jackson, MS 39209

MISSOURI

127. **Name:** **Missouri Fish Farmers Association**
 Type: Producer Association
 Address: P.O. Box 90, Columbia, MO 65205
Inquiries To: James Kahrs, Secretary-Treasurer
 Key Staff/
 Members: Emerson, Dwight; Past President
 Flowers, William; Vice President
 Kahrs, James; Sec-Treasurer
 Lucke, Wayne F.; President
 Services: Information
 Goals: Promote successful aquaculture
 Publications: Bylaws; Membership application.
Available From: Dr. Richard O. Anderson, Missouri Fish Farmers Association, P.O. Box 90, Columbia, MO 62505

128. **Name:** **Missouri Department of Agriculture**
 Address: 100 East Capitol, Jefferson Building, Jefferson City, MO 65101; (314) 751-4339
Inquiries To: S. Wayne Yokley, Director, Agricultural Development Division
 Status: State
User Obligation: Payment of a fee
 Aquaculture
 Staff: Boillot, James B.; Director; responsible for all facets of agriculture in Missouri
 Francka, Joe; State Entomologist; maintains surveillance of all feed manufacturers' label guarantees
 Haerer, Ray; Supervisor; Scale Division; maintains surveillance of all scales used in commerce
 Hagan, John; Supervisor, Bureau of Pesticide Control; certifies and licenses pesticide applicators in accordance with Federal and state pesticide laws
 Lansford, John P.; Commodity Marketing Specialist; assists in promoting and marketing aquaculture products statewide
 Ryan, Jack; Director; International Marketing Division; provides advice and assistance in all facets of international marketing
 Yokley, S. Wayne; Director; Agricultural Development Division; provides advice and services for aquaculture in keeping with procedures for other Missouri commodity groups

- Aquaculture**
Programs: Regulatory and assisting
Priority
Services: Domestic marketing, international marketing, regulatory services
Goals: To assist in the development of markets for aquaculture products and to adapt the Missouri Department of Agriculture's regulatory and service functions to assist in aquaculture growth; assist the industry to grow to its potential and compete adequately with other states' aquaculture and other forms of agriculture in general
129. **Name:** Missouri Department of Conservation
Address: P.O. Box 180, 2901 North Ten Mile Drive, Jefferson City, MO 65102; (341) 751-4115
Inquiries To: Lawrence C. Belusz, Fisheries Extension Biologist
Status: State
Aquaculture
Staff: Belusz, Lawrence C.; Fisheries Extension Biologist; extension information services, workshops, seminars, publications
Camenisch, Gary W.; Fish Pathologist; cold-water diagnostic and treatment services
Hicks, Charles E.; Superintendent of Hatcheries; administration of statewide hatchery system - coordination of state and private needs
Suppes, Charles V.; Fish Pathologist; warm-water diagnostic and treatment services
- Aquaculture**
Programs: Extension
Priority
Services: Disease diagnostic services, extension education workshops, cooperative studies
Goals: Provide leadership, facilities, and support for aquaculture research and development; make surplus eggs or fish of unique species or characteristics available to commercial producers on a fair cost basis
Publications: *Fish Farming - What You Should Know; Raising Catfish for Food and Fun; Fishlines Newsletter.*
Available From: Lawrence C. Belusz, Fisheries Extension Biologist, Missouri Department of Conservation, P.O. Box 180, Jefferson City, Missouri 65102
130. **Name:** United States Trout Farmers Association
Type: Producer Association, Industry-wide Association
Address: P.O. Box 171, Lake Ozark, MO 65049; (314) 365-2478
Inquiries To: Tim Pilkington, Executive Director
Key Staff/
Members: Bloomfield, Clyde; Treasurer; Rogers, Arkansas
Busch, Robert; USTFA representative to United Food Animal Association, Buhl, Idaho
Godfriaux, Bruce; Director; Newark, New Jersey
Green, Mike; Western Vice President; Twin Falls, Idaho
Kangas, Steve; Director; Scandia, Minnesota
Mackey, Phil; Director; Red Bluff, California
McLeary, Russ; Secretary; McMillin, Washington
Miller, Del; Eastern Vice President; Cary, Illinois
Mitchell, Fern Wood; USTFA representative to U.S. Aquaculture Council, Lacey Spring, Virginia
Murrison, Ed; Chairman of the Board; Snelling, California
Pilkington, Tim; Executive Director; Lake Ozark, Missouri

Ray, Leo; President; Buhl, Idaho
 Ruppel, Bill; Director; Eldred, New York
 Strohm, Edmund C.; Director; Newville, Pennsylvania
 White, Clark; Director; Paradise, Utah

Services: Information, industry representation to national councils, conferences, and government

Goals: Create a strong, unified voice for the trout industry of the United States

Publications: *SALMONID Journal*; USTFA Brochure with membership application; TROUT recipe booklet.

Available From: USTFA, P.O. Box 171, Lake Ozark, MO 65049

NEBRASKA

131. **Name:** Nebraska Game and Parks Commission
Address: 2200 North 33rd Street, Lincoln, NE 68503; (402) 464-0641
Inquiries To: Wes Sheets, Assistant Chief Fisheries Division
Status: State
User Obligation: Required license for private culturist and request biological assistance

Aquaculture Staff: Gleim, Jim; Hatchery Assistant; disease assistance
 Sheets, Wes; Assistant Chief Fisheries Division

Aquaculture Programs: Extension
Priority Services: Disease diagnostic sampling
Goals: Long-term goal is to assure compatibility between private aquaculture pursuits and freshwater sport fish resources

NEW MEXICO

132. **Name:** New Mexico Department of Agriculture
Address: P. O. Box 3189, Las Cruces, NM 88003
Inquiries To: Dr. William P. Stephens, Secretary/Director, New Mexico Department of Agriculture, P. O. Box 3189, Las Cruces, NM 88003
Status: State

Aquaculture Staff: Brooks, Emmet H.; Inspector; sampling
 Greathouse, Jack A.; Inspector; label review
 Houk, Lyle A.; Inspector; registration
 Patterson, Barry; Chief, Pesticide Management; pesticide spills investigations
 Pfeifer, Charles G.; Inspector; analysis of fish food

Aquaculture Programs: Regulatory
Priority Services: Feed analysis, pesticide spills
Goals: Accuracy of label guarantee on fish food products; investigate pesticide spills as required

NEW YORK

133. **Name:** New York State Department of Environmental Conservation
Address: 50 Wolf Road, Room 518, Albany, NY 12223; (518) 457-5430
Inquiries To: Robert H. Griffiths, Superintendent of Fish Culture
Status: State
User Obligation: Submit a formal request
Criteria: Commodity, limited to certain species

Aquaculture Staff: Griffiths, Robert H.; Superintendent of Fish Culture; supervision of aquacultural services
Parker, Carl E.; Chief, Office of Freshwater Fisheries Economic Development; prepares Department of Environmental Conservation strategic plan for freshwater fisheries economic development, including sections on recreational fisheries, commercial fisheries, and aquaculture

Aquaculture Programs: Extension, production

Aquaculture Priority Services: 1. Issue discretionary annual permits to private fish hatcheries to propagate, raise, and sell trout and black bass (largemouth, smallmouth) for propagation or stocking pursuant to ECL 11-1909. 2. Annually certify out-of-state private hatcheries to sell trout in NYS pursuant to ECL 11-1715(2) and 11-1727. 3. Provide informal advice on diagnosis, treatment, and prevention of fish diseases, and on fish cultural techniques in general. 4. Produce 750,000 pounds of coldwater and warmwater species in 12 state fish hatcheries.

Goals: Facilitate development and/or maintenance of a viable freshwater aquaculture industry in New York State to help satisfy consumer needs for food fish and baitfish

Publications: *Program Reports, Fish Disease Inspection and Hatchery Performance of 1980 Lake Ontario Spring-Run Steelhead in the Salmon River; Program Reports, Muskellunge Swim-up Fry Mortality at Chautauqua Hatchery During May 1980; Program Reports, An Epizootic of Coldwater Disease (Cytophago psychrophilo) in Adirondack and Finger Lake Strains of Lake Trout at the Chateaugay Fish Hatchery during the winter of 1979-80; Iodophor Disinfection of Muskellunge Eggs and Intensive Culture in Hatcheries. Progressive Fish Culturist Vol. 41, Oct. 1979, pp. 189-190; Walleye Fry--Shipping and Stocking Mortality. Progressive Fish Culturist Vol. 42, Oct. 1980, pp. 238-239.*

Available From: NY State Department of Environmental Conservation, Rm. 518, 50 Wolf Rd., Albany, NY 12223

NORTH CAROLINA

134. **Name:** North Carolina Cooperative Fishery Research Unit
Address: North Carolina State University, Box 5577, Raleigh, NC 27650
Inquiries To: Dr. M. T. Huish, Unit Leader
Status: Cooperative
Aquaculture Staff: Huish, Melvin T.; Unit Leader; research/training
Kesby, Howard J.; Marine Science Cooperation; research/training

Aquaculture Programs: Research, formal education

Aquaculture Priority Services: Research, training

Goals: Develop and improve culture methods for various species and provide the information to potential users; train students

Publications: *Growth and Survival of Striped Bass and White Perch Hybrids; A Review of Methods, Advances, and Problems Associated with Culture of the Striped Bass and its Hybrids; Cryogenic Preservation of Striped Bass Spermatzoa.*

135. **Name:** **Smoky Mountain Trout Growers Cooperative**
 Type: Cooperative
 Address: Box 5032, Asheville, NC 28803; (704) 274-2089
 Inquiries To: Dick Jennings, Market Coordinator
 Key Staff/
 Members: Bayliss, Peggy; Secretary
 Jennings, Dick; Market Coordinator
 Ziegler, Charles; President
 Services: Marketing
 Goals: Provide a market plan for growers in the Southeast
136. **Name:** **N.C. Wildlife Resources Commission**
 Address: 512 N. Salisbury St., Raleigh, NC 27611
 Inquiries To: W. Donald Baker, Chief, Division of Inland Fisheries
 Status: State
 Aquaculture
 Staff: Field staff; inspect facilities proposed for licensing and
 report on compliance with regulations, provide technical
 advice as requested
 Aquaculture
 Programs: Licensing
 Priority
 Services: Issuance of licenses authorizing operations, technical
 assistance/advice
137. **Name:** **North Carolina Division of Marine Fisheries**
 Address: P.O. Box 769, Morehead City, NC 28557
 Inquiries To: Michael W. Street, Chief, Fisheries Management Section
 Status: State
 Aquaculture
 Staff: Marshall, Michael D.; Marine Biologist I; shellfish biologist
 Munden, Fentress H.; Marine Biologist II; Coordinator of
 Shellfish Management Program
 Parker, Jerry A.; Marine Biologist I; shellfish biologist
 Taylor, David L.; Marine Biologist I; shellfish biologist
 Aquaculture
 Programs: Extension
 Priority
 Services: Evaluation of shellfish bottom lease applications,
 recommendations on management of oyster and clam leases
138. **Name:** **Haywood Technical College**
 Address: Freedlander Drive, Clyde, NC 28721; (704) 627-2821
 Inquiries To: Charles W. Johnson, Fishery Training Specialist
 Status: State
 User Obligation: Payment of a fee
 Aquaculture
 Staff: Johnson, Charles W.; Fishery Training Specialist; aquaculture
 extension program planning, extension, conduct community
 college courses
 Aquaculture
 Programs: Extension, information services
 Priority
 Services: Continuing education in aquaculture; organizing and conducting
 aquaculture related courses for state community colleges;
 assisting with the needs of the trout industry in Western North
 Carolina

139. **Name:** **North Carolina Cooperative Extension Service**
 Address: Department of Zoology, Box 5577, NCSU, Raleigh, NC 27650
 Inquiries To: Dr. David J. DeMont, Extension Fisheries Specialist
 Status: State, Cooperative
 User:
 Criteria: North Carolina
 Aquaculture
 Staff: DeMont, Dr. David J.; Assistant Professor and Extension
 Fisheries Specialist; aquaculture research and extension
 Aquaculture
 Programs: Research, formal education, extension
 Priority:
 Services: Advice to new aquaculturists, diagnosis of aquaculture
 problems, aquaculture training for Agricultural Extension
 Service Agents
 Goals: Survey N.C. aquaculture, coordinate aquacultural activities of
 N.C. agencies; promote orderly development of N.C. aquaculture

OHIO

140. **Name:** **Ohio Department of Natural Resources, Division of Wildlife**
 Address: Fountain Square, Building C-4, Columbus, OH 43224
 Inquiries To: Clayton Lakes, Hatchery Supervisor
 Status: State
 User:
 Criteria: Ohio resident
 Aquaculture
 Staff: Haffner, Jay; Hatchery Superintendent; salmon pond culture
 Keyes, Pat; Assistant Hatchery Superintendent; warmwater
 culture
 Nagel, Tim; Hatchery Superintendent; trout and saugeye (sauger
 x walleye) culture
 Now, Dean; Hatchery Superintendent; yellow perch and northern
 pike warmwater culture
 Pfister, P.J.; Hatchery Superintendent; trout, muskie, and
 tiger muskie culture and disease control
 Riddle, Steve; Hatchery Superintendent; salmon hatching and
 trough culture
 Aquaculture
 Programs: Informational
 Priority:
 Services: Publish list of fish propagators
 Goals: Production of sauger x walleye hybrid, production of
 muskellunge x northern pike hybrid, development of dry feeding
 technique
 Information
 Available From: Clayton Lakes, Hatchery Supervisor, 8589 Horseshoe Road,
 Ashley, OH 43003

OKLAHOMA

141. **Name:** **Oklahoma Cooperative Fishery Research Unit**
 Address: LSW 433 Oklahoma State University, Stillwater, OK 74078; (405)
 624-6342
 Inquiries To: O. Eugene Maughan; Unit Leader
 Status: Cooperative
 Aquaculture
 Staff: Classen, M.; Research Associate; research
 da Silva, A.; Research Associate; research
 Ewing, M.; Fish Disease Specialist; disease consultation
 Gebhart, G.; Fish Culturist; Field Coordinator
 Maughan, O. E.; Unit Leader; Principal Investigator
 Schwartz, D.; Research Associate; research

Williams, K.; Research Associate; research

Aquaculture
Programs: Research, extension
Priority
Services: Accumulation of research information; consultation with fish producers; information transfer
Goals: Evaluate artisanal fish culture systems for transfer to developing countries and small U.S. landowners; evaluate polyculture systems for use in low density cage culture
Publications: *Feasibility of mixed cage culture of Tilapia and channel catfish. Proceedings of the Inland Commercial Fisheries Workshop, March 13, 1980, Nashville, Tennessee; The feeding preference of Tilapia aurea (Steindachner) among five aquatic plants. Fourth Biennial Research Symposium; Small-scale fish culture in existing farm ponds. Langston University.*
Available From: Coop. Fish Research Unit Office, LSW 433, Oklahoma State University 74078

OREGON

142. **Name:** Oregon Cooperative Fishery Research Unit
Address: Department of Fisheries, Oregon State University, Corvallis, OR 97331
Inquiries To: Carl B. Schreck
Status: Cooperative
Aquaculture
Staff: Schreck, Carl B; Unit Leader; salmonid research
Aquaculture
Programs: Research, formal education
Priority
Services: Research on pond loading, size and time for the release of anadromous salmonids, natural maturation and spawning
Goals: Improve the performance of hatchery salmonids in terms of increasing their return as adults
Publications: *Hormone-induced ovulation of coho salmon (Oncorhynchus kisutch) held in seawater and freshwater. Canadian Journal of Fish. Aquat. Sci. 39(4):627-632.*
Available From: Oregon Cooperative Fishery Research Unit, Department of Fisheries, Oregon State University, Corvallis, OR 97331
143. **Name:** Oregon Department of Fish and Wildlife
Address: P.O. Box 3503, Portland, OR 97208
Inquiries To: Ed Cummings, Staff Fish Biologist
Status: State
User Obligation: Payment of a fee for permits and licenses
User
Criteria: Must be consistent with state statutes and technical capability
Aquaculture
Staff: Cummings, Ed; Staff Fish Biologist; operating finfish propagation facilities and administering regulations pertinent to private aquacultural activities
Aquaculture
Programs: Research, finfish propagation
Priority
Services: Fish production, administration of regulations, fish production support activities
Goals: Production of fish for public use, regulation of public harvest, and private production
Available From: Oregon Dept. of Fish and Wildlife, P.O. Box 3503, Portland, OR 97208

PENNSYLVANIA

144. **Name:** US Department of Interior, Fish and Wildlife Service, National Fishery Research and Development Laboratory
 Address: R.D. 4, Box 47A, Wellsboro, PA 16901; (717) 724-3322
 Inquiries To: Roger Lee Herman, Director
 Status: Federal
 Aquaculture Staff: Fuss, Joseph T.; Aquaculture Engineer
 Herman, Roger Lee; Pathologist
 Lemm, Carol; Nutritionist
 Meade, Jim; Culture Technician
 Rottiers, Donald V.; Physiologist
- Aquaculture Programs:** Research, extension
 Priority Services: Research to improve aquaculture techniques; extension of information to aquaculture community; diagnostic services
 Goals: Develop intensive culture methods for selected coolwater sport/food fishes, increase efficiency of intensive fish culture, improve quality of cultural fishes
 Information Available From: National Fishery Research and Development Lab and National Fisheries Center, Kearneysville, WV
145. **Name:** Pennsylvania Fish Commission
 Address: P.O. Box 1673, Harrisburg, PA 17120
 Inquiries To: Engineering - Edward R. Miller, Fisheries - Delano R. Graff
 Status: State
 User Obligation: Pay a fee (for diagnostic or water quality lab services), submit a formal request, some free information exchanged via telephone
- User Criteria:** Pennsylvania Fish Commission activities have first priority; however, if someone can demonstrate a legitimate need, we will help for a nominal fee
- Aquaculture Staff:** Corl, Kenneth G.; Chief, Coldwater Production Section; trout and salmon culture
 Graff, Delano R.; Chief, Division of Fisheries; management, administration, and coordination of various fisheries aspects
 Hood, Shyrl E.; Chief, Warmwater Production Section; esocid, percid, salmonid, and minnow aquaculture
 Miller, Edward R.; Assistant Executive Director; Design Engineer, Planner, Administrator
 Mudrak, Vincent A.; Chief, Fisheries Research Section; water quality, permits, and disease control
- Aquaculture Programs:** Research, formal education, extensive culture of various fish species
 Priority Services: Diagnostic services, water quality services, periodic workshops
 Goals: Maintain put-and-take program, maintain put-grow-and-take program, develop new aquaculture research such as diet development, genetics, extensive and intensive culture
- Publications:** Bibliography available.
 Available From: PA Fish Commission Library, Benner Spring Fish Research Station, R.D. 1, Box 485, Bellefonte, PA 16823

PUERTO RICO

146. **Name:** Corporation for the Development and Administration of the Marine, Lacustrine, and Fluvial Resources of Puerto Rico (CODREMAR)
 Address: CODREMAR, P.O. Box 2629, San Juan, PR 00903; (809) 725-7200
 Inquiries To: Inoel Rivera Lopez, Acting Executive Director
 Status: State
User Obligation: Submit a formal request
 User
 Criteria: Proof of domain on the intended culture area
 Aquaculture Staff: Cortes, Ricardo; Chief Program Coordinator, Fisheries Research Lab; evaluation of submitted proposals from the technical standpoint
 Rivera, Jose E.; Fisheries Specialist; evaluation of submitted proposals from the technical standpoint
 Tilen, Eli; Assistant Executive Director for Fisheries Affairs; economist

 Aquaculture Programs: Credit/financing, promotion
 Priority
 Services: Promote the development of a warm water aquaculture industry in Puerto Rico; assist potential investors in formulating their plans in accordance with the existing conditions and governmental priorities; assist and/or provide financial assistance to approved aquaculture projects

 Goals: Develop an aquaculture industry for the island; long term - start promoting model farms for the culture of different organisms under CODREMAR's promotion.

 Publications: *Aquaculture Development in Puerto Rico - A Prospectus;*
 Aquaculture Development Master Plan for Puerto Rico.

Available From: Mr. Inoel Rivera Lopez - Executive Director, CODREMAR, P.O. Box 2629, Old San Juan, PR 00903

RHODE ISLAND

147. **Name:** Rhode Island Aquaculture Association
 Type: Producer Association
 Address: P.O. Box H, Kingston, RI 02881; (401) 539-2858
 Inquiries To: Bruce Rogers, President
 Key Staff/
 Members: Levine, Gerald; Treasurer
 Macy, William; Secretary
 Murray, Link; Former Secretary
 Rogers, Bruce; President
 Silkes, Bill; Former President
 Westin, Deborah; Editor of Newsletter and Former Treasurer

 Services: Technical/advisory, information
 Goals: Promote interests of practicing commercial aquaculturists in the State of Rhode Island

 Publications: *RIAA Newsletter.*

Available From: RIAA, P.O. Box H, Kingston, RI 02881
148. **Name:** Rhode Island Division of Fish and Wildlife
 Address: Coastal Fisheries Laboratory, Succotash Rd., RR1, Wakefield, RI 02879; (401) 783-2304
 Inquiries To: William J. Lapin, Marine Biologist

Status: State
Aquaculture Staff: Karlsson, John D.; Marine Biologist; maintains and operates the Division's bay scallop hatchery
 Lapin, William J.; Marine Biologist; aquaculture advisor, liason (private sector and state government agencies), researcher
Aquaculture Programs: Research, extension
Priority Services: Provide prospective aquaculturists with information and advice regarding culture techniques and regulatory procedures; review proposals for conducting aquaculture within the coastal waters of the state; issue special permits to aquaculturists, exempting them from certain Fish and Wildlife laws.
Goals: Encourage the growth of private aquaculture within the coastal waters of the state; guide the expansion of the industry to avoid conflicts with other traditional uses
Publications: *An Aquaculture Management Plan for Rhode Island Coastal Waters.*
Available From: Rhode Island Division of Fish and Wildlife, Coastal Fisheries Laboratory, Succotash Rd., RR1, Wakefield, RI 02879

SOUTH CAROLINA

149. Name: Marine Resources Research Institute, Marine Resources Division, S.C. Wildlife and Marine Resources Department
Address: 217 Fort Johnson Road, P.O. Box 12559, Charleston, SC 29412; (803) 795-6350
Inquiries To: Frank S. Taylor, Aquaculture Specialist
Status: State
User Obligation: Submit a formal request
User Criteria: Printed information free to S.C. residents - slight charge to out-of-state residents; technical assistance available at no charge to S.C. residents
Aquaculture Staff: Jenkins, Wallace; Mariculture Specialist; pond culture of prawns and advisory services on prawns
 Liao, Dr. David; Aquaculture Economist; economic evaluation of culture projects
 Manzi, Dr. John J.; Associate Scientist; Pilot Clam Mariculture Project cooperatively with private company
 Marchette, Don; Mariculture Specialist; sturgeon culture
 Sandifer, Dr. Paul A.; Assistant Director; develops mariculture as a viable enterprise in South Carolina; prawns, hybrid bass, sturgeon, baitfish, clams, and oysters
 Smith, Dr. Ted I.J.; Associate Scientist; prawn, bass, and sturgeon culture
 Stokes, Al; Mariculture Specialist; pond culture of prawns and site selection and recommendations
 Taylor, Frank S.; Mariculture Specialist; engineers and designs systems, develops facility aquaculture plan, potential for geothermal water culture of prawns, potential for culture of marine bait species in S.C., informational services on Institute's mariculture programs
 Williams, Josie; Mariculture Specialist; hybrid bass culture
Aquaculture Programs: Research, extension
Priority Services: Provide informational material, technical assistance, and on-site analysis and system development
Goals: Develop commercial seafood production farms in South Carolina; rehabilitate, maintain, and expand certain fisheries, especially recreational ones, through stocking impoundments,

embayments, salt water ponds; establish South Carolina as a center for technical training, public and private-supported research, and investment in mariculture
Available From: Frank S. Taylor, P.O. Box 12559, Charleston, SC 29412 (\$.10 per page plus postage to out-of-state residents)

150. **Name:** **South Carolina Water Resources Commission**
 Address: P.O. Box 50506, Columbia, SC 29250
 Inquiries To: Danny L. Johnson, Chief, Environmental Affairs
 Status: State
 Aquaculture
 Staff: Lonon, Gerald; Chief, Surface Water Hydrology; surface water availability
 Ranson, Camille; Chief, Ground Water Hydrology; ground water availability

 Aquaculture
 Programs: Extension
 Priority
 Services: Provide information on the availability of surface water and ground water for aquaculture
151. **Name:** **South Carolina Department of Agriculture**
 Recently established committee, under sponsorship of S.C. Sea Grant Consortium, no official title to date
 Address: P.O. Box 11280, Columbia, SC 29211; (803) 758-2425
 Inquiries To: Ralph M. Magoffin, Deputy Commissioner
 Status: State
 Aquaculture
 Staff: Magoffin, Ralph M.; Deputy Commissioner; member of recently formed Committee on Aquaculture

 Aquaculture
 Programs: Advisory
 Priority
 Services: Marketing (regional and international)
 Goals: None set as yet

SOUTH DAKOTA

152. **Name:** **South Dakota Cooperative Fishery Research Unit**
 Address: South Dakota Cooperative Fishery Research Unit, South Dakota State University, Brookings, SD 57006
 Inquiries To: Richard L. Applegate, Unit Leader
 Status: Cooperative
 Aquaculture
 Staff: Applegate, Richard L.; Unit Leader; directs graduate-level research in coolwater fish culture

 Aquaculture
 Programs: Research, formal education
 Priority
 Services: Develop broodstock, provide information on intensive coolwater fish culture

 Publications: *Growth of Muskellunge in a Power Plant Cooling Reservoir; Food Selection of Muskellunge Fry; Seasonal Distribution of Esocids in a Power Plant Cooling Reservoir.*

Available From: Use organization address

TENNESSEE

153. **Name:** **Tennessee Valley Authority, Fisheries and Aquatic Ecology Branch**
 Address: TVA Fisheries and Aquatic Ecology Branch, 445 Evans Building, Knoxville, TN 37902; (FTS-856-3243) (615) 632-3243
 Inquiries To: William M. Seawell, Program Manager
 Status: Federal
 User:
 Criteria: Tennessee Valley
 Aquaculture:
 Staff: Collins, Charles M.; Biologist; waste heat research
 Sample, W. David; Biologist; extension
 Seawell, William M.; Program Manager; fisheries resource enhancement

 Aquaculture:
 Programs: Research, extension
 Priority:
 Services: Extension (technical assistance); development and demonstration of waste heat (power plant discharge) utilization and intensive culture systems (Gallatin); economic (marketing) analysis and assistance

 Goals: Short term - expand our capability to offer on-site technical assistance, investigate other species for waste heat aquaculture; Long term - increase bait minnow production in Tennessee Valley, establish industry (aquaculture) use of power plant waste heat

 Publications: Extension literature from various universities is distributed upon request.
 Available From: TVA Fisheries and Aquatic Ecology Branch, 445 Evans Bldg., Knoxville, TN 37902
154. **Name:** **Tennessee Wildlife Resources Agency**
 Address: P.O. Box 40747, Nashville, TN 37204; (615) 741-1575
 Inquiries To: Hudson M. Nichols, Chief, Fish Management Division
 Status: State
 Aquaculture:
 Staff: Cobb, Eugene S.; Fisheries Biologist Region I; technical advice
 Conder, John R.; Fisheries Biologist Region I; technical advice
 Hargis, Harry L.; Fisheries Biologist Region II; technical advice
 Little, James D.; Fisheries Biologist Region III; technical advice
 Myhr, Anders I.; Fisheries Biologist Region III; technical advice
 Pelren, Douglas; Fisheries Biologist Region II; technical advice
 Peterson, Douglas; Fisheries Biologist Region IV; technical advice
 Wilkins, L. Price; Fisheries Biologist Region IV; technical advice

 Aquaculture:
 Programs: Extension
 Priority:
 Services: Technical advice on rearing fish, weed problems, and management procedures

 Goals: Provide technical assistance to those in need
 Publications: *The Management of Tennessee Ponds and Small Lakes; Catfish Farming in Tennessee; Farm Pond Fishing.*
 Available From: Fish Management Division, Tennessee Wildlife Resources Agency, P.O. Box 40747, Nashville, Tennessee 37204

TEXAS

155. **Name:** **Texas Agricultural Extension Service**
 Address: Room 104, Systems Building, Texas A and M University, College Station, TX 77843
 Inquiries To: Milo J. Shult; Project Supervisor in Wildlife and Fisheries
 Status: Cooperative
 User:
 Criteria: Compliance with Smith-Lever and subsequent legislation
 Aquaculture:
 Staff: Davis, James T.; Fisheries Specialist; producer assistance management
 Higginbotham, Billy; Fisheries Specialist
 Johnson, S.K.; Fish Disease Specialist
 Shutt, Milo J.; Project supervisor in Wildlife and Fisheries
 Steinbach, Don; Fisheries Specialist
- Aquaculture Programs:** Extension
 Priority:
 Services: Fish Disease Diagnostic Laboratory; management assistance and consultation; marketing assistance and development
 Goals: Ten percent of all reservoirs and canals will be managed for increased recreation and food production; 20 percent of aquaculturists increase income through efficiency and recognize opportunities for production of alternate species; increase agricultural income in 10 counties through development of resources currently being utilized
- Publications:** *Mortalities Produced in the Protozoae Stages of Penaeid Shrimp by an Unspeciated Amoeba; Tet Disease of Tropical Fishes and Correction; Liming Farm Fish Ponds in East Texas.*
- Available From:** Milo J. Shult, Room 110, Nagle Hall, College Station, Texas 77843
-
156. **Name:** **Fish Farmers of Texas**
 Type: Producer Association
 Address: P.O. Box 2948, College Station, TX 77840
 Inquiries To: Norma Milsap, Executive Secretary
 Key Staff/
 Members: Davis, Jim; 2nd Vice President
 Edwards, W.S.; 1st Vice President
 Giffen, Jack; President
 Glaser, Stanley; Secretary
 Kelly, Jim; Treasurer
 Milsap, Norma; Executive Secretary
 Zwahr, Kenneth; Past President
- Services:** Information
 Goals: Take the necessary social and political actions that will ensure the future of aquaculture in the State of Texas
-
157. **Name:** **Texas Department of Water Resources**
 Address: 1700 N. Congress, Stephen F. Austin State Office Building, Austin, TX 78701; (512) 475-3187
 Inquiries To: Harvey Davis, Executive Director
 Status: State
 Aquaculture:
 Staff: Davis, Harvey; Executive Director

Aquaculture
Programs: Water planning and water use regulation
Publications: *Texas Department of Water Resources; Basic Information Regarding Permits; Texas Water Facts.*
Available From: Texas Dept. of Water Resources, 1700 N. Congress, Stephen F. Austin State Office Bldg., Austin, TX 78701

158. Name: **Texas Parks and Wildlife Department**
Address: 4200 Smith School Road, Austin, TX 78744
Inquiries To: William P. Rutledge, Hatchery Coordinator
Status: State
Aquaculture
Staff: Alexander, Glenn; Hatchery Superintendent; operates State Fish Hatchery
Bowling, Bill; Hatchery Superintendent; operates State Fish Hatchery
Campbell, David; Hatchery Superintendent; operates State Fish Hatchery
Campbell, Larry; Regional Fish Culturist; coordinates regional aquaculture programs
Clary, Wallace; Hatchery Superintendent; operates State Fish Hatchery
Engelhardt, Ted; Hatchery Superintendent; operates State Fish Hatchery
Gray, Charles; Regional Fish Culturist; coordinates regional aquaculture programs
Hutson, Pat L.; Hatchery Superintendent; operates State Fish Hatchery
Lowman, Ted; Regional Fish Culturist; coordinates regional aquaculture programs
McCarty, Gene; Hatchery Superintendent; operates State Fish Hatchery
Palmer, Bobby; Hatchery Superintendent; operates State Fish Hatchery
Rutledge, William P.; Aquaculture Coordinator; coordinates statewide aquaculture programs
Wagner, Warren; Hatchery Superintendent; operates State Fish Hatchery
Warren, Joe; Hatchery Superintendent; operates States Fish Hatchery
White, Billy; Regional Fish Culturist; coordinates regional aquaculture programs
Aquaculture
Programs: Problem consultation

159. Name: **Texas Crawfish Farmer's Association**
Type: Producer Association
Address: P.O. Box 1456, Orange, TX 77630; (713) 883-7740, Ext. 308
Inquiries To: Don Kachtik, Secretary
Key Staff/
Members: Arabie, Wesley; President; Rt. 4, Box 1310, Orange, Texas 77630, (713) 745-1825
Burton, Owen; Board Member; P.O. Box 104, Mauriceville, Texas 77626, (713) 746-2219
Cormier, Bobby; Board Member; P.O. Box 258, Orangefield, Texas 77639, (713) 735-3571
Douglas, Ronnie; Board Member; P.O. Box 458, Sour Lake, Texas 77659, (713) 287-3192
Granger, Charles; Board Member; P.O. Box 104, Orangefield, Texas 77639, (713) 745-1384
Heinen, Joe; Board Member; Rt. 6, Box 445, Orange, Texas 77630, (713) 746-3422

Kachtik, Don; Secretary; P.O. Box 1456, Orange, Texas 77630,
(713) 883-7740, Ext. 308
McClain, Ray; Board Member; Rt. 6, Box 65, Orange, Texas 77630,
(713) 746-2812
Parish, Mike; Vice-President; P.O. Box 830, Mauriceville, Texas
77626, (713) 886-3617
Roy, A. A.; Board Member; P.O. Box 220, Mauriceville, Texas
77626, (713) 745-1141

Services: Research, information, marketing, promotion of crawfish
Goals: Encourage proper crawfish production, promote quality,
marketing, secure new markets, promote harmony among crawfish
producers, promote research and demonstrations in production
and marketing

UTAH

160. **Name:** Utah Cooperative Fishery Research Unit
Address: Utah State University, UMC 52, Logan, UT 84321
Inquiries To: Dr. Ross V. Bulkley, Unit Leader
Status: Cooperative
User Obligation: Funds for research from commercial operators
Aquaculture
Staff: Berry, Dr. C. R.; Assistant Leader, Research Biologist;
teaching/research
Bulkley, Dr. R. V.; Unit Leader, Research Biologist;
teaching/research
Workman, Dr. Gar; Fish and Wildlife Extension;
teaching/extension

Aquaculture
Programs: Research, formal education, extension
Priority
Services: Teaching (Principles of Fish Culture, Warmwater Pond Fish
Culture); research (evaluation of rainbow trout strains for
fitness and performance, inland commercial fisheries);
extension
Goals: Strengthen the professional training and continuing education
of fishery scientists, conduct research which will aid in the
wise management of the aquatic resource, and disseminate
research results through appropriate communications media
Publications: *Survival of fingerling rainbow trout of different lactate
dehydrogenase phenotypes. In: Progressive Fish-Culturist;*
Smith, C. and C. Berry, 1977, The use of histology in fish
culture, Presented at the 107th Annual Meeting, Amer. Fish
Society. Ut. Coop. Fish. Res. Unit. USU, UMC 52, Logan, UT
84321. 12 page mimeo.

VIRGINIA

161. **Name:** Virginia Cooperative Extension Service
Address: 152 Cheatham Hall, Blacksburg, VA 24061
Inquiries To: Dr. Louis A. Helfrich, Extension Specialist, Fisheries
Status: Cooperative
Aquaculture
Staff: Helfrich, Dr. Louis A.; Extension Specialist, Fisheries;
consultation and education

Aquaculture
Programs: Research, extension
Priority
Services: Education, information transfer, research
Goals: Determine the status of aquaculture in Virginia; determine
aquaculture-related research needs; develop information
directed toward developing small-scale, non-commercial

Publications: aquaculture operations to assist farm family need (food)
Commercial Aquaculture in Virginia in 1978; Catfish Farming in Cages in Virginia's Ponds and Lakes; Planning for Commercial Aquaculture.

Available From: Virginia Cooperative Extension Service, 152 Cheatham Hall, Blacksburg, VA 24061

162. Name: Virginia Cooperative Fisheries Research Unit
Address: Department of Fisheries and Wildlife, Virginia Polytechnic Institute, Cheatham Hall, Blacksburg, VA 24061
Inquiries To: Dr. G.B. Pardue, Unit Leader
Status: Cooperative
User:
Criteria: Virginia
Aquaculture:
Staff: Pardue, Dr. G.B.; Unit Leader, VA CFRU; extension
Aquaculture:
Programs: Research, formal education, extension
Priority:
Services: Teaching formal course, pilot research, extension consulting
Goals: Determine through pilot research programs which aquacultural systems and species are applicable for Virginia; develop a viable aquaculture program in Virginia

Publications: *Commercial Frog Farming; Commercial Catfish Farming in Virginia. Ext. Pub. MT8H, VPI and SU. 5 p.; Planning for Commercial Aquaculture Ext. Pub. MT2H, VPI and SU. 91.*

Available From: Department of Fisheries and Wildlife, Virginia Polytechnic Institute, Cheatham Hall, Blacksburg, VA 24061

163. Name: Virginia Department of Agriculture and Consumer Services, Division of Markets, Bureau of Market and Economic Development
Address: 1100 Bank Street, Room 801, Washington Building, Richmond, VA 23219
Inquiries To: Posey R. Young, Transportation Specialist
Status: State
Aquaculture:
Staff: Mayes, C.C.; Supervisor; Information/Marketing
 Young, P.R.; Transportation Specialist; information/marketing and transportation
Aquaculture:
Programs: Marketing/transportation
Priority:
Services: Information only at this time

164. Name: U.S. Aquaculture Federation
Type: Federation of Aquaculture Associations
Address: P.O. Box 276, Lacey Springs, VA 22833; (703) 433-2395
Inquiries To: Fern Wood Mitchell, Chairman
Key Staff/
Members: Brown, Keith
 Freeman, Mark
 Lindberg, Jon
 Lockwood, George
 Loring, Richard
 Mitchell, Fern Wood; Chairman
 Ray, Leo
Services: Information, representation of the aquaculture industry to the Federal Government
Goals: Serve as a center for interaction between the aquaculture industry and the Federal Government

VERMONT

165. **Name:** **Vermont Cooperative Extension Service**
 Address: Extension Natural Resources, School of Natural Resources, Aiken
 Center, University of Vermont, Burlington, VT 05405
 Inquiries To: Linda Marek, Extension Water Resources Specialist
 Status: Cooperative
 User:
 Criteria: In Vermont
 Aquaculture
 Staff: Marek, Linda; Extension Water Resources Specialist; extension
 education
 Aquaculture
 Programs: Extension
 Priority:
 Services: Extension education, technical information when there has been
 a fish kill or outbreak of disease, one-on-one education
 Goals: Increase interest in fish pond production by Vermonters;
 increase bait fish and trout production in Vermont; work with
 researches to identify, synthesize and publish information
 pertaining to start-up costs of aquaculture operations,
 expected returns, marketing procedures, and prime sites for the
 location of fish farms in Vermont
 Publications: *Fish Farming in Vermont, Br. 1307; Farming for Fun and*
 Profit-Aquaculture, Brieflet 1333.
 Available From: Publications Office, The Extension Service - University of
 Vermont, Morrill Hall, Burlington, VT 05405

WASHINGTON

166. **Name:** **American Salmon Growers Association**
 Type: Producer Association
 Address: 10420 173rd Street, S.W., Rochester, WA 98579
 Inquiries To: Howard Johnson
 Key Staff/
 Members: Feldt, Bill; Weyerhaeuser
 Fisher, Pete; Fisher Foods
 Johnson, Howard; Secretary
 Lindberg, John; Consultant
 Swecker, Dan; President
 Services: Technical/advisory, legislative/public education
 Goals: Provide technical information to members and public agencies
167. **Name:** **Washington State University Cooperative Extension Service,**
 Washington Sea Grant
 Address: Courthouse, Box 552, Montesano, WA 98563; (206) 249-4332
 Inquiries To: Steve C. Harbell, Area Marine Resources Extension Agent
 Status: Cooperative
 User:
 Criteria: Site visits only in coastal counties
 Aquaculture
 Staff: Harbell, Steve C.; Marine Resources Extension Agent; extension
 in marine and freshwater shellfish and finfish culture
 Aquaculture
 Programs: Extension
 Priority:
 Services: Research, extension, formal education - college courses
 Goals: Shellfish and finfish aquaculture development and
 diversification, technical assistance and problem solving for

established growers
Publications: *Coho Salmon Farming in Puget Sound; Vibriosis -- A Common Disease of Salmon; Trout Farming in Washington.*
Available From: WSU Extension, Courthouse, Box 552, Montesano, WA 98563

168. Name: Washington State University, Sea Grant Program, Cooperative Extension Service
Address: 1918 N.E. 78th Street, Vancouver, WA 98665
Inquiries To: Mike Spranger, Marine Resources Specialist
Status: Cooperative
User Obligation: None
User:
Criteria: None
Aquaculture Staff: Harbell, Steve; Extension Marine Agent; saltwater/freshwater aquaculture
 Humphreys, Jim; Extension Marine Agent; saltwater/freshwater aquaculture
 Nosh, Terry; Aquaculture/Shellfish Specialist; saltwater aquaculture
 Spranger, Mike; Marine Resources Specialist; freshwater aquaculture
Aquaculture Programs: Research, extension
Priority:
Services: Research, on-site field demonstration, consulting, education workshops
Publications: *Catalog of Marine Publications*
Available From: Sea Grant Communication Office, 3716 Brooklyn Avenue, N.E., Seattle, WA 98105

169. Name: National Marine Fisheries Service, Aquaculture Research Station
Address: P.O. Box 38, Manchester, WA 98353
Inquiries To: Conrad Mahnken, Oceanographer/Program Manager
Status: Federal
User:
Criteria: Salmonids
Aquaculture Staff: Damkaer, David; Oceanographer; environmental quality
 Hardy, Dr. Ronald; Fishery Biologist; salmonid nutrition
 Harrell, Lee W.; Veterinarian; diseases of salmonids
 Mighell, James; Fishery Biologist; marine culture of Pacific/Atlantic salmon brood stocks
 Milner, George; Geneticist; genetics of cultured salmonids, population genetics
 Novotny, Anthony; Fishery Biologist; salmonid diseases
 Prentice, Earl; Fishery Biologist; smoltification, freshwater hatchery technology
 Utter, Dr. Fred; Geneticist; salmonid stock improvement, induced polyploidy, gynogenesis
 Zaugg, Dr. Waldo; Chemist/Physiology; physiology of smoltification
Aquaculture Programs: Research
Priority:
Services: Improved technology for public salmonid hatcheries; production of brood stocks for enhancement of threatened wild and hatchery salmonid stocks; salmonid genetics (hatchery and population genetics)
Publications: Bibliography of publications.

170. **Name:** **Pacific Coast Oyster Growers Association**
 Type: Producer Association
 Address: 1437 Elliott Avenue West, Seattle, WA 98119; (206) 283-2860
 Inquiries To: W. Arnold Waring, President
 Key Staff/
 Members: McMillin, David C.; Vice President
 Steele, R.N.; Past President
 Services: Research funding, lobbying
 Goals: Provide matching funds for government programs that benefit our industry

171. **Name:** **Washington State Department of Fisheries**
 Address: Room 115, General Administration Building, Oly, WA 98504
 Inquiries To: William James, Aquaculture Program Manager
 Status: State
 User Obligation: Payment of a fee (for salmon eggs), submit a formal request
 Aquaculture
 Staff: Amos, Kevin; Virologist/Pathologist; disease control, certification, technical advice
 James, William; Aquaculture Program Manager; monitors salmon aquaculture and regulates licensed farms
 Westley, Ron; Assistant Director, Shellfish Division; shellfish aquaculture
 Aquaculture
 Programs: State management agency
 Priority
 Services: Provide limited technical advice to licensed aquaculture farms; provide excess viable salmon eggs to licensed aquaculture farms

172. **Name:** **West Coast Clam Growers Association**
 Type: Producer Association
 Address: S.E. 2220 Lynch Road, Shelton, WA 98584
 Inquiries To: Bill Taylor, Secretary/Treasurer, S.E. 130 Lynch Road, Shelton, WA 98584
 Key Staff/
 Members: Becker, Peter; Vice President; S.E. 2220 Lynch Road, Shelton, WA 98584
 Haefliger, Ed; President; E1950 Hwy. No. 3, Shelton, WA 98585
 Taylor, Bill; Secretary/Treasurer; S.E. 130 Lynch Road, Shelton, WA 98584
 Services: Research, technical/advisory, information, marketing, political action
 Goals: Promote the general welfare of the West Coast clam growers industry and other closely related seafood industries in Oregon, Washington, California, Alaska, province of British Columbia, and other places the corporation trustees deem proper

WISCONSIN

173. **Name:** **U.S. Fish and Wildlife Service**
 Address: Fish Disease Control Center, P.O. Box 1595, La Crosse, WI 54601-0146; (608) 783-6451
 Inquiries To: James W. Warren or Howard M. Jackson
 Status: Federal
 User
 Criteria: Primarily Great Lakes area plus Iowa and Missouri; inspection services only to members of Great Lakes Private Fish Health Protection Cooperative
 Aquaculture
 Staff: Jackson, Howard M.; Assistant Hatchery Biologist; diagnosis of

infectious disease, certain inspection services, consultation
 Warren, James W.; Hatchery Biologist; program direction, consultation, diagnosis of infectious disease, certain inspection services

Aquaculture
Programs: Annual Fish Disease Shortcourse
Priority
Services: Diagnostics, inspections, training
Goals: Provide leadership to Great Lakes Fish Disease Control Program organized under the Great Lakes Fishery Commission, provide virology laboratory services to state agencies unable to perform the required procedures, provide a source of training for field personnel

Publications: *Diseases of Hatchery Fish.*
Available From: U.S. Government Printing Office, Washington, DC 20402

174. **Name:** National Fishery Research Laboratory, U.S. Fish and Wildlife Service
Address: P.O. Box 818, La Crosse, WI 54601; (608) 783-6451
Inquiries To: Director, National Fishery Research Laboratory
Status: Federal
User Obligation: Submit a formal request
User
Criteria: Our involvement is with researchers and sponsors of chemicals and drugs used in aquaculture. Research related to aquaculture is performed in concert with FWS priorities for needed compounds. We do not provide direct services to private individuals other than requests for information.

Aquaculture
Staff: Abidi, Sharon L.; Chemist; development of methods for analysis of chemicals in fish
 Allen, John L.; Analytical Chemist; analytical methods development and residue dynamics
 Bailey, Tom A.; Fishery Biologist; testing of fungicides for fungal infections on fish
 Bills, Terry D.; Fishery Biologist; screening of candidate drugs and chemicals, lethal and sublethal effects of drugs and chemicals
 Burress, Ralph M.; Fishery Biologist; field studies on efficacy of drugs and chemicals
 Chandler, Jack H.; Fishery Biologist; studies of effects of drugs and chemicals on invertebrates
 Chew, Leslie E.; Fishery Biologist; fish culture for research testing
 Crowther, John R.; Fishery Biologist; fish culture for research use
 Dawson, Verdel K.; Chemist; development of analytical methods and water chemistry studies
 Gilderhus, Philip A.; Fishery Biologist; field studies on efficacy of drugs and chemicals
 Gingerich, William H.; Physiologist; uptake, metabolism, elimination, and mode of action of drugs and chemicals
 Hales, Donald C.; Assistant Director; Research Administrator
 Hanson, Lee H.; Fishery Biologist; development of sea lamprey control methods and chemosterilization
 Holland, Leslie E.; Fishery Biologist; ecological studies on larval fishes
 King, Everett L.; Fishery Biologist; development of sea lamprey control methods and lamprey biology and behavior
 Marking, Leif L.; Toxicologist; screening of candidate drugs and chemicals, lethal and sublethal effects of drugs and chemicals
 Meyer, Fred P.; Director; Research Administrator

Rach, Jeffrey R.; Fishery Biologist; physiological effects of drugs and chemicals on fish
 Schnick, Rosalie A.; Technical Information Specialist; chemical and drug registration, reference library
 Seelye, James G.; Fishery Biologist; development of sea lamprey control methods and water chemistry studies, attractants, and repellents
 Sills, Joe B.; Chemist; analytical methods development and residue dynamics
 Sylvester, Joseph R.; Fishery Biologist; ecological studies on large rivers

**Aquaculture
 Programs:
 Priority
 Services:**

Research

Research in chemical and drug registration; negotiation with EPA and FDA on registration and use of fishery chemicals; research and development on tools to control nuisance aquatic organisms

Goals:

Short term - registration of at least one tool for use in controlling bacteria, parasites, viruses, fungi, and undesired fish and plants; Long term - registration of all chemicals and drugs used in aquaculture and fisheries management

Publications:

U.S. Fish and Wildlife Service Publications--calendar year 1981, La Crosse National Fishery Research Laboratory, Southeastern Fish Control Laboratory, and Hammond Bay Biological Station.

Available From:

Rosalie A. Schnick, Technical Information Officer, National Fishery Research Laboratory, P.O. Box 818, La Crosse, Wisconsin 54601

175. Name: Wisconsin Trout Growers, Inc.

Type: Nonprofit Corporation

Address: Box 15, Lewis, WI 54851

Inquiries To: Hugo Kettula, Secretary

Key Staff/

Members:

Berglin, Jack; President
 Brunner, Larry; Chairman of the Board
 Dosch, Gail; Vice President
 Fannin, Richard; Director
 Gurtner, John; Director
 Kettula, Hugo; Secretary/Treasurer
 Miller, Del; Director
 Winker, Robert; Director

Services:

Information

Goals:

Promote the trout industry in Wisconsin
Trout Growers Creel.

Publications:

Available From:

Wisconsin Trout Growers, Inc., Box 15, Lewis, Wisconsin 54851

Section III. Recent Programs of State Cooperative Extension Services

Since October 1979, there has been coordination of aquaculture efforts at the USDA level by the Program Leader for Fish and Wildlife within the Natural Resources unit of the Extension Service, U.S. Department of Agriculture. For many years, educational information has been provided on aquaculture through formal and informal clinics, workshops, training courses, demonstrations, on-farm problem identification and solving, pilot programs, publication dissemination, mass media, farm family programs, and advisory committees by State Cooperative Extension Services through their state fisheries/aquaculture specialists and county agents.

Following are examples of State Cooperative Extension Service aquaculture programs across the United States during 1981 based on needs and the resources available. These select programs were taken from the Narrative Accomplishment Reporting System (NARS) which is a data base of executive summary reports on recent program achievements of the Cooperative Extension Service.

James E. Miller, Program Leader
Fish and Wildlife
Extension Service, USDA
Washington, D.C.
(202)447-5468

ENTRY 176. CATFISH -- ALABAMA

Commercial catfish producer education was emphasized to major production areas to keep producers abreast of new research information to aid in providing a more consistent supply. Over 10,000 acres of ponds are operated for commercial production by 550 producers. Target audiences include small and large scale producers. Three circulars related to commercial catfish production were published, along with a mimeograph of 15 enterprise budgets. A three-day catfish disease workshop for 27 producers, and three area meetings involving 200 producers were held. Evaluation of investment opportunities for potential catfish producers was a major activity as catfish farming became Alabama's most profitable and attractive farm enterprise. Catfish acreage increased 7%, so did the total number of producers. Alabama ranks second in the nation in catfish production. Fee-fishing, not included in crop reporting board reports, accounts for an estimated 2,500 acres. Extension assisted an entrepreneur with a new fee-fishing business that included small ponds built in an urban area, densely stocked, and periodically restocked, with fish grown on the farm. Four thousand pounds of catfish are sold each week from this operation during the summer from two 0.7-acre ponds.

Contact Person: John W. Jensen, Fisheries Specialist
Alabama Cooperative Extension Service
Auburn University
Auburn, Alabama 36849

177. FISHERIES MANAGEMENT -- ALABAMA

Recreational pond management educational programs were carried out Statewide to improve owner management skills and fishing success for pond owners and fishermen. Two circulars with information on pond management techniques were published. A third publication, Home-Grown Fish from Cages, and a supporting slide set are available. They describe how to build a cage, stock it, and feed, maintain and harvest the fish. The audience is pond owners interested in raising catfish or trout for home use. This publication was produced through a cooperative grant from the U.S. Fish and Wildlife Service.

Pond clinics held at "pond banks" in several counties two to three times per day included demonstrations, audience participation, and problem solving. Clinics were successful and emphasized during FY-82. More than 130,000 acres of farm ponds are presently used for recreational fishing. Approximately 80 fishing occasions per acre occur in farm ponds, making them the most heavily fished water resource in Alabama. New techniques for pond liming and fertilization developed by research methods have been disseminated by Extension. This could result in a 50% savings to pond management.

Contact person: John W. Jensen, Fisheries Specialist
Alabama Cooperative Extension Service
Auburn University
Auburn, Alabama 36849

178. PROCESSING AND MARKETING OF FISH -- ALABAMA

Educational programs were conducted to help producers evaluate alternatives for marketing, including development of new outlets for processed fish, and help with Health Department regulation compliance. Target audiences included large and small scale processors, as well as producer groups. The 20 small scale catfish processors operating in Alabama process approximately 2 million pounds of catfish. Three large scale mechanized processing plants process approximately 10 million pounds per year. One of the latter plants struggles to survive due to inconsistent supplies from local producers. The total value of the catfish industry to processors approaches \$15,000,000 annually. Groups of producers unable to sell fish on a timely basis are studying the possibilities of building new processing plants in Alabama. Considerable time was spent assisting these groups and evaluating their needs, processing plant feasibility, and market outlets. With Extension assistance, a fourth processing plant opened in January of 1982 to process approximately 20,000 pounds of catfish per day. Educational programs have also been conducted in some counties where marketing strategies are unique. Live-haulers, fee-fishing, and small scale processing all have been studied. Several groups are combining methods to improve their marketing capabilities.

Contact person: John W. Jensen, Fisheries Specialist
Alabama Cooperative Extension Service
Auburn University
Auburn, Alabama 36849

179. GEORGIA EDUCATIONAL PROGRAMS FOR SPORT FISH POND OWNERS

Georgia has approximately 60,000 acres of privately-owned ponds and lakes, but most are not managed for recreational and economic value. This program informs pond owners of their resource opportunities and provides them with educational assistance. Materials have been developed to support county sport fish pond management programs. These include a newsletter sent to county agents for distribution, a quarterly newsletter for agents with subjects adapted for radio and newspaper releases, an update newsletter for county agents used as a reference source, and a county program planning guide for sport fish pond management. The program has been in place for 3 fiscal years (1979-1981). Program effectiveness and impact can be measured by increases in requests for county management short courses and distribution of newsletters. In FY 1979, 11 county short courses were conducted with an attendance of 331. In 1980, 15 short courses were given and 475 attended. In 1981, 21 short courses were conducted with an attendance of 651. Newspaper distribution to producers went from 4,000 per issue to 7,000.

Contact person: George W. Lewis, Extension Fisheries Specialist
Cooperative Extension Service
University of Georgia
Athens, Georgia 30602

180. PILOT EDUCATIONAL TRAINING PROGRAM -- GEORGIA

The state is developing an intensive county agent aquaculture training program. When completed, at least one agent in each county will have attended a two-day training session. An aquaculture agent's handbook is being developed and will be issued to each county office. At the completion of this project, program outline, lesson plans, and handbook will be available for use by other State Extension Services. Most agents do not have extension experience or a formal education in fisheries management/aquaculture, and thus, are hesitant to provide in-depth services. This program will provide adequate training and reference materials to agents to improve county aquaculture program information and expertise. Eight of the sixteen agents attending recent training did not include aquaculture in their county program plan of work, but five stated they would include aquaculture in future county programs. All sixteen agents felt the program strengthened their ability to provide clients with aquaculture services.

Contact person: George W. Lewis, Extension Fisheries Specialist
Cooperative Extension Service
University of Georgia
Athens, Georgia 30602

181. AQUACULTURE ON FAMILY FARMS IN KANSAS

The Extension aquaculture goal for 1981 was to inform farm families and county Extension agents about increasing Extension opportunities in small scale aquaculture. Private farms make up about 98% of the total land in Kansas. Small family farms comprise about two-thirds of the 72,000 farms. There are over 100,000 farm ponds in the State. There was no Extension specialist trained in aquaculture in Kansas, but through a cooperative effort among the Extension wildlife specialist, a fisheries biologist from the State Wildlife Agency, and a fisheries teacher from the Kansas State University biology staff, a pilot Extension aquaculture project was begun. A pamphlet was produced on managing farm ponds for fish and wildlife, and a workshop conducted on fish pond management in cooperation with Highland Junior College. Field tours of cage catfish farming for county agents were held. The county Extension agents, landowners, and pond managers learned of the feasibility of management techniques and opportunities in small scale cage culture. Sixty-eight potential aquaculturists attended the first evening workshop. Thirteen county agents attended the field tour. Three thousand eight hundred pamphlets were requested since publication. Small farm families can use fish raised in cages for home use that will supplement their diets and help the food budget, and the surplus fish can be sold locally. Plans include starting research and evaluation of Extension teaching methods on a small scale for farm families with aquaculture potential.

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182. AQUACULTURE -- KENTUCKY

An effort is underway to establish commercial and recreational use of Kentucky cold water springs -- an unusual resource -- by testing quality of water in 30 large springs. A State specialist worked with a Kentucky geological survey team and six county staff to set up studies of large cold water springs. State specialists worked with three county agents to make local spring owners aware of cold water fish production using unused water resources. During the initial year, the first commercial trout farm was established. Six additional trout farms were completed and two more are under construction. Nine trout farms were in operation by 1982. Fry hatching began at three Kentucky trout farms with 300,000 hatched successfully in 1981. The first established farm raised and sold 80,000 pounds of cultured trout during 1981. Gross sales of the 1981 crop were \$200,000. Six hundred thousand pounds of trout were the goal during FY 82.

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183. CRAWFISH BUSINESS MANAGEMENT -- LOUISIANA

Crawfish farming is a rapidly expanding business. Extension provides information necessary for planning, cost identification, and marketing. Economic specialists meet with individual farmers and present information to farmer organizations. Seven Extension agents and Soil Conservation Service personnel participate in the development of budgets, price series, and media material. Over 350 crawfish farmers in Louisiana received financial and marketing information for management of their yields. Additional farmers in Texas, Mississippi, and South Carolina received pond investment, water supply, and trapping costs for design of their systems. Harvest costs were emphasized with alternative mechanized methods of harvesting identified. Mechanical harvest will increase greatly in the near future. Future programs will emphasize additional harvest alternatives and crawfish culture in rotation with other crops.

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184. AQUACULTURE -- MICHIGAN

Leading State fish culturists were identified and contacted resulting in requests for assistance. Information that Federal laws had been amended to classify a fish culture operation as a "farm" was used to convince a zoning board that agricultural property purchased in their district for expansion of a fish culture operation should remain zoned for agricultural use and not rezoned for industrial use. Assistance was provided in designing a water sterilization system for a rainbow trout hatchery under construction. Once completed, the owner will obtain "disease free" certification to become the only private hatchery certified in Michigan. Programs and media coverage of the new aquaculture program resulted in contacts with individuals interested in the potential of establishing commercial fish culture operations. Only one individual has the training and appropriate water resources necessary to establish a feasible fish culture facility. He was provided considerable assistance in preparation of the Farmer Home Administration application supporting documents. The remaining 70+ individuals saved \$2,000-\$5,000 each in investments, construction of ponds, or other fish culture facilities. With information provided, the individuals were able to determine that their proposed facility would not be economically feasible, or that they lacked the training necessary to raise fish. Two individuals saved \$175,000 each since information provided assisted them in making their decision not to purchase an existing trout farm which cannot be operated at profit without significant changes in facility design.

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185. CATFISH FARMER TRAINING -- MISSISSIPPI

In 1980, there was an increase of 12,999 acres (47.5%) of catfish ponds. Fish farmers and their employees needed training in all aspects of catfish farming. Seven, two-day workshops for new fish farmers were conducted by two fisheries specialists and two county agents. Cooperative funds were provided through Extension Service-UDSA; 287 fish farmers, their employees, and representatives of leading institutions attended these workshops. These individuals had 10,609 acres farmed and planned to add 13,841 acres more. This represents a \$37 million investment, and a planned investment of \$48 million. This rapid growth has increased employment opportunities on fish farms and new jobs in a needed support industry. The increase in number of soil analyses for chlorinated hydrocarbons prior to building catfish ponds indicated the effectiveness of one part of the training in creating an awareness of potential problems. Continued success and growth of fish farming will necessitate additional programs for training new farmers in the basic management techniques of fish farming. Also, established farmers will need advance training to acquaint them with the latest techniques and developments.

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186. MISSOURI'S PLAN FOR AQUACULTURE

Missouri has developed a plan to guide development of the aquaculture industry in the State. It was developed by the Missouri Aquacultural Advisory Council which Extension helped to establish. The Council is made up of selected State agencies related to aquaculture, and key individuals and organizations representing the State aquaculture industry. The status of the industry was determined and a guideline for growth developed. Clientele will have a reference manual for information and technical assistance sources. Regulations and regulatory agencies are concerns for fish farmers, and these agencies are involved in this Council. A survey of 750 persons presently engaged in aquacultural operations determined that education, technical assistance, and disease identification were the greatest constraints to growth. Financing is also a major obstacle. Missouri currently ranks in the top seven States in recreational fishing, catfish, trout, and ornamental fish production, which amounts to a \$20 million industry, with growth potential. Improved management could increase production in about 300,000 impoundments.

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187. DISASTER RELIEF FOR OYSTERMEN -- NEW JERSEY

Through the efforts of the Cooperative Extension Service Marine Agent, Farmers Home Administration (FmHA) provided low interest disaster relief loans to six New Jersey oystermen. Through a University of Connecticut CES publication, the Cape May, N.J., county agent learned about the disaster relief program. He met with FmHA officials to determine whether the program could be used to provide relief for the oyster industry, which endured extreme hardship in 1981 caused by the MSX disease, with mortality as high as 60%. A meeting was arranged between Rutgers University specialists, FmHA officials, and oystermen, at which specialists explained by use of historical data, the MSX problem was caused by drought, a "natural" disaster. As a result, the FmHA opened the disaster relief program to the six oystermen with low interest (5%) loans to replace lost seed stock. This should open the door for increased FmHA responsibilities with the fishing community.

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188. MANAGEMENT OF NORTH CAROLINA SHELLFISH RELAY

An applied research project determined that the movement (relay) of oysters from polluted water to cleaner waters for purging and reharvesting could add potential growth returns to fishermen in three North Carolina counties. This determination was made by estimating existing stocks growing in polluted waters which could be moved to cleaner water without damaging potential growing stocks. This suggests a potential new lease arrangement for use of polluted waters to grow out oyster harvesting and marketability.

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189. COMMERCIAL CATFISH AND CRAWFISH PRODUCTION -- SOUTH CAROLINA

Commercial catfish and crawfish production in South Carolina are not major industries at present, but the interest of landowners in freshwater aquaculture has increased dramatically during the last five years. Requests for production and marketing information are indicative of the need to help potential farmers. Additional information, especially on marketing, is needed by landowners making application for aquaculture loans. Based on success in neighboring states, South Carolina will become more involved in this area and will require more Extension input the next few years.

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190. FISHERIES MANAGEMENT -- TENNESSEE

The Extension fisheries educational program is designed to provide useful information to pond owners to help them achieve optimum production of both recreational and commercial aquaculture operations. There are about 170,000 farm ponds in the State with sport fisheries potential. Rainbow trout and channel catfish are cultured commercially by about 105 producers. Information for farm pond management continues as a primary fisheries interest in Tennessee. In-service training in fisheries management was provided to Extension county agents, other Extension personnel, and 20 Soil Conservation Service personnel. Fisheries information is dispensed via news articles, radio and TV programs, phone calls, letters or bulletins. There were visits to farms with ponds, and laboratory diagnoses of parasites, disease or aquatic weeds also were made and the control measures provided. Weed control by use of selected herbicide and Chinese grass carp was demonstrated. The program involves one full-time fisheries specialist and local county Extension agents when information is requested by pond owners. Personnel from TVA, TWRA, SCS, and USF&WS are responsive cooperators as needed. Clientele response included demand for larger fish, increased production, better survival of fish and elimination of weed problems. Records of clientele contacts are maintained on a daily basis. Information recipients were questioned as to the appropriateness of the responses provided. Interest in aquaculture is increasing and more individuals are requesting information.

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191. EXPANDED CRAWFISH PRODUCTION -- TEXAS

Intensified crawfish production in Texas began in 1973 on the A. A. Roy Farm in Mauriceville. Production was inadequate, and the Texas Agricultural Extension Service was asked for assistance. In the spring of 1977, Mr. Roy constructed 4 demonstration ponds. In these ponds, improved production methods have resulted in harvests exceeding 2,000 pounds per acre, or a ten-fold increase. Average production in crawfish ponds has increased over 150% in four years due to improved production techniques. As these innovations are adopted by other growers, a constant supply to the market is assured. It is estimated that the market for live crawfish for table use exceeds 50,000 pounds per week in Texas which would require a minimum of 5,000 acres. Processing of tail meat should become a reality soon which opens a new vista for producers. From the 63 acres in production in 1977, the acreage devoted to crawfish increased to over 2,000 acres harvested during 1980. Production per acre and prices received have increased sufficiently to make crawfish a very attractive enterprise. Farmers in Southeast Texas are the primary producers of crawfish, but demonstration farms have been established as far north as the Dallas/Ft. Worth area. Efforts are being expanded with demonstrations

scheduled in 26 counties compared to 9 counties in the previous year. Areas of the State with a high clay content soil and an adequate water supply will be investigated.

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192. AQUACULTURE IN VERMONT

The goal of this program is to offer information on alternatives to the traditional small-scale aquacultural enterprises. A 56-page hands-on booklet, Fish Farming in Vermont, was prepared and published. This serves as the main text for workshops and individual consultations. A slide-tape show was developed, TV programs were conducted, and a display prepared for use at fairs and other public places. A video tape of a successful fish farming operation and a home-steading operation was filmed. Aside from the large audiences reached through the TV programs and display, individuals receive private consultations to deal with their specific problems and questions related to aquaculture. Some individuals were just beginning to raise fish, while others had been raising fish but had run into problems including disease and poor water quality. Those individuals with problems were recontacted to assure that advice has been followed and results achieved.

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193. AQUACULTURE -- VIRGINIA

Seven educational programs for food retailers in five market areas were conducted to teach methods of management, merchandizing, quality maintenance and sanitation. A total of 195 retail food stores in the Mid-Atlantic states participated. Newspaper articles were prepared on "food from the sea," which appeared in daily and weekly newspapers. Information was disseminated to over 2,100 consumers at the Maryland Waterman's Association Trade Show on the handling and processing methods for marine food sources. Technical assistance was provided for crab meat processors to develop adequate pasturization, and to locate adequate containers for crab meat. These programs were conducted by staff from the Extension Food Science Department, the Department of Agricultural Economics and Seafood Extension Agents, stations at Hampton and on the Eastern Shore. The Mid-Atlantic Fisheries Development Foundation and several retail food organizations cooperated and furnished funding. Retail stores management indicated the program attendees increased the volume and quality of their seafood merchandizing sanitation.

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194. FISH PRODUCTION IN FARM PONDS -- VIRGINIA

Over 50,000 farm and urban ponds in Virginia are owned and controlled by private landowners. These structures represent a large aquatic resource particularly suited to production of a nutrient source -- fish for home consumption and commercial development. Diverse audiences are interested in developing this fisheries resource throughout the State. Individual pond owners, corporate entities and the Virginia Legislature have expressed the desire to develop an aquaculture program within the State.

Extension's freshwater aquaculture program provides educational information and technical assistance designed to assess the constraints and potential opportunities for development of private ponds in Virginia. Specialists have established and are monitoring one research-demonstration catfish cage culture project, and plan projects in two additional locations. These demonstrations have the dual purpose of identifying managerial techniques and providing practical methods of rearing caged fish. Further development of techniques plus educational programs will provide substantial fish protein for human consumption, supplement the nutritional needs of low income families, and add variety to the tables of others.

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